NOVEMBER 1940—FORTY-SEVENTH YEAR

MACHINERY

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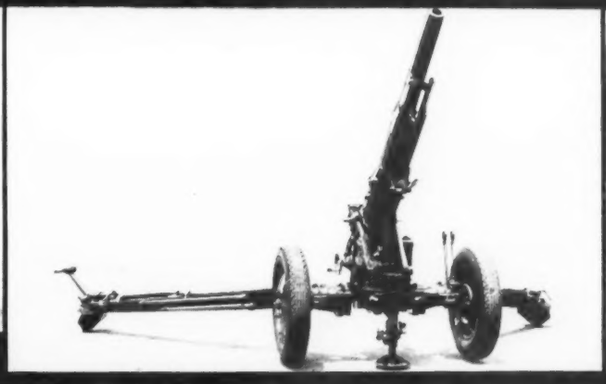

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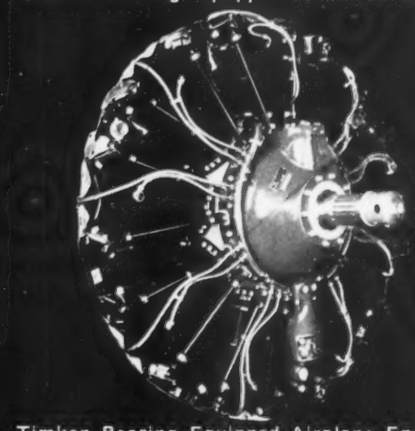

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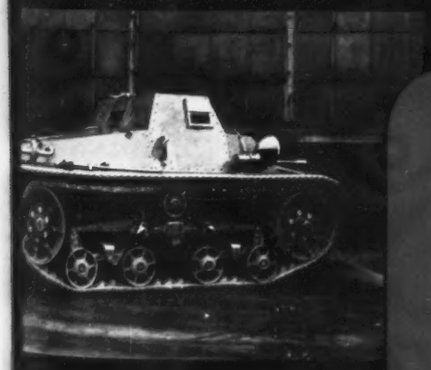

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MACHINERY

NOVEMBER, 1940

The oil industry plays an important basic part in the entire Defense Program. Equipment for the oil industry is equal in importance to armaments. The leading article in December MACHINERY, "Pumps for the Oil Fields," will describe the manufacturing operations in a well-known plant on the Pacific Coast that has been building oil-well pumps to high-quality standards for more than forty years. Other articles in the December number will deal with aircraft manufacture, factors affecting welding costs, cost reduction by carbide tools, building tank engines, and advanced practices in polishing die-castings.

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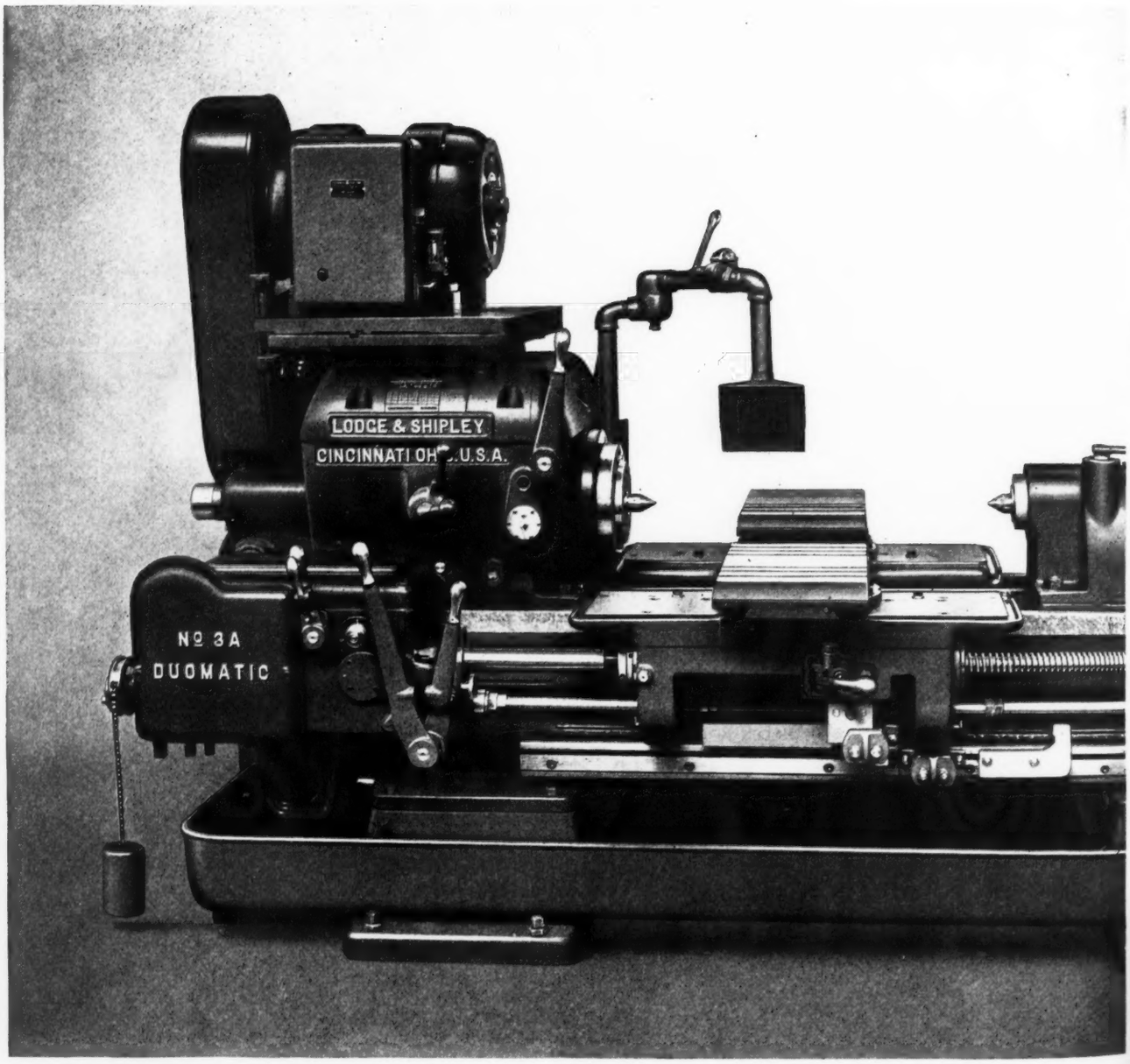

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American Industry Gets Behind National Defense

olume 47 MACHINERY, NEW YORK, NOVEMBER, 1940 Number 3

BILLIONS of dollars have been appropriated by Congress with the practically unanimous approval of the nation to place the armed forces of the United States on such an efficient fighting basis that no combination of powers will dare attack us. The job of converting immense sums of money into battleships, tanks, guns, airplanes, shells, and other fighting equipment now falls on the shoulders of American industry. Our army arsenals and naval establishments will be capable of turning out only about 10 per cent of the implements of war demanded under the National Defense Program.

American industry accepts this responsibility. Already, it has invested many millions of dollars of its own funds in erecting and equipping new manufacturing plants to meet the present emergency. Factories that are now making toys will soon be manufacturing fuses; locomotive shops and automobile plants will be producing artillery shells in large quantities; and so on. One of the country's largest railway-car building plants is now turning out quantities of 12-ton tanks for the Army; another concern that has long specialized in the production of safes is busily engaged in building 3-inch anti-aircraft gun carriages; and a company that ordinarily produces Diesel and gasoline engines for a variety of marine and industrial uses is manufacturing Diesel engines for Army tanks and earth drills to be used in both the constructive and the destructive activities of the Army.

Generous cooperation on the part of the War Department has made it possible for MACHINERY to record in this number some of the activities of these concerns who represent only a few of a great number that are already contributing substantially toward the success of the National Defense Program. These articles once more emphasize the fact that machine tools constitute our first line of defense, for without machine tools, there could be no battleships, tanks, guns, or other munitions of war.

★ United States Army Tanks fr

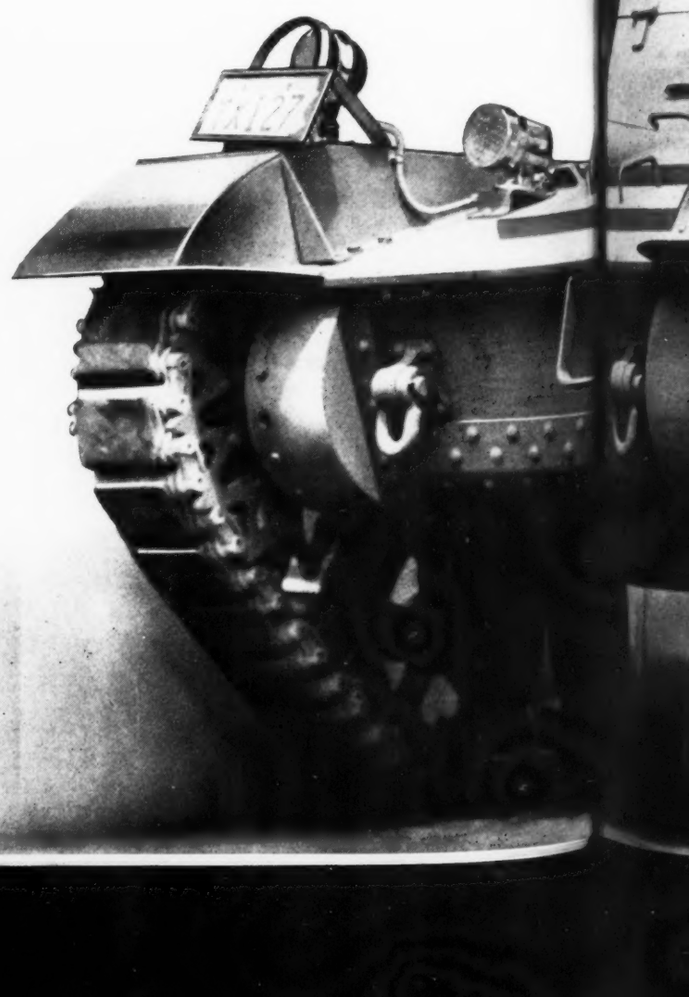
Production Achievement of the American Car and Foundry Company in Carrying Out the National Defense Program

LONG before Germany's Army Chiefs conceived the mechanized (Panzer) divisions which have swept the battlefields of Europe with the devastating effect of the "Blitzkrieg," tests were conducted by our own Army which indicated the possibilities of the tank as an offensive weapon. The war in Europe has proved in a conclusive manner the earlier theories of our own Army Officers. The finest armies in the world cannot withstand the onslaught of tanks guided by the watchful eyes of airplane observers unless they are similarly equipped. While tanks alone do not win battles, they win advanced positions, which can be rapidly taken over by infantry and artillery organizations, and keep on advancing with such startling suddenness that whole armies are soon surrounded by the enemy.

If it should ever become necessary for the United States Army to defend our land in modern warfare, it must be supplied with tanks by the thousands. The Government has therefore embarked on a tank building program designed to meet the challenge of any attacking army. The early fulfillment of this program depends upon the resourcefulness of the American metal-working industry.

The speed with which this industry can get into action when given the signal to go ahead is shown by the record of the American Car and Foundry Company which is today turning out twelve-ton tanks in Berwick, Pa. This concern had never built a tank when it received an order for 329 in September, 1939. In less than seven months' time, approximately seventy-five machine tools had been installed and completely tooled up for the interchangeable manufacture of tank parts in what had previously been a paint shop; an armor-plate carburizing and heat-treating plant had been fitted out; and tank assembly lines had been established, similar to the manufacturing procedure of the automobile industry. Much of the credit for the speedy preparation of this plant for tank production is due Guy C. Beishline, district manager, and Henry B. Ensign, manager of the Ordnance Division, who applied the practical experience gained in years of railway-car building on a progressive basis to the new problem. Since the original order was placed, this concern has received another order for 627 tanks, making total of 956 so far.

The tanks built by the American Car and Foundry Company are designated by the Army as "M2A4." They are equipped with either gasoline-driven radial airplane type engines or Diesel engines of radial design. The tanks can operate at highway speeds in excess of 35 miles an hour and across open country at high speeds. The engine is mounted at the rear, and drives through a transmission at the front which gives five forward speeds and one reverse speed. The fighting equip-



from a Car-Building Plant ★

By CHARLES O. HERB

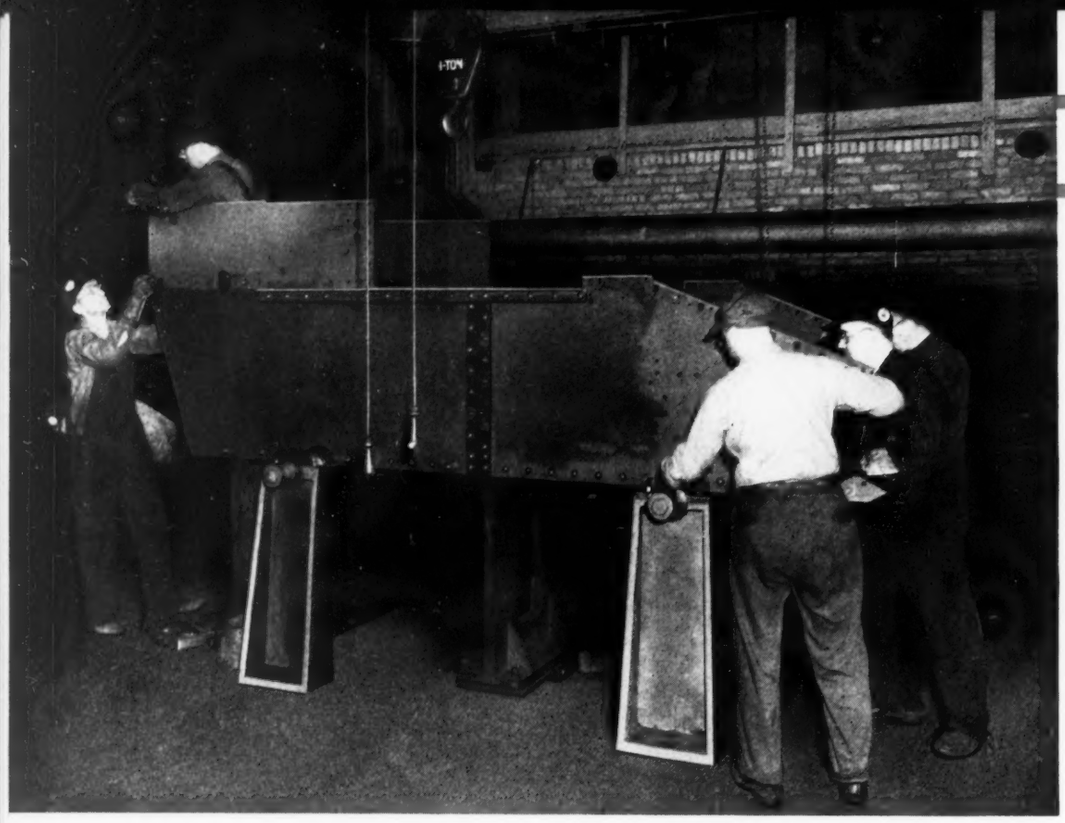


Fig. 1. Assembling the Bottom and Side Plates of the Tank Hull to the Front and Rear Axles on a Jig at the Beginning of the Assembly Line

ment consists of machine guns and 37-millimeter guns. The occupants are protected by armor plate.

The assembly methods employed in constructing the tanks will first be outlined, and then a considerable number of machining operations on tank parts will be described. All pieces of armor plate for the tank hull and turret are drilled to receive rivets, and the plate edges are planed to insure close fits. When these operations have been completed, the armor-plate sections are carburized and heat-treated to develop maximum projectile-resisting qualities. They are then sent to the preliminary assembly line. There the pieces that make up the turret are assembled together on the turret base-ring, which is mounted on a simple fixture placed on a large flat casting. The holes in the bent steel straps that are used to fasten the armor-plate sections together on the inside have previously been drilled under size to receive rivets. No holes are punched, experience having shown that in punching holes in armor plate, invisible cracks may be produced that will open up in service. The straps are attached to the armor-plate sections by bolts, the holes for which are reamed to the proper size

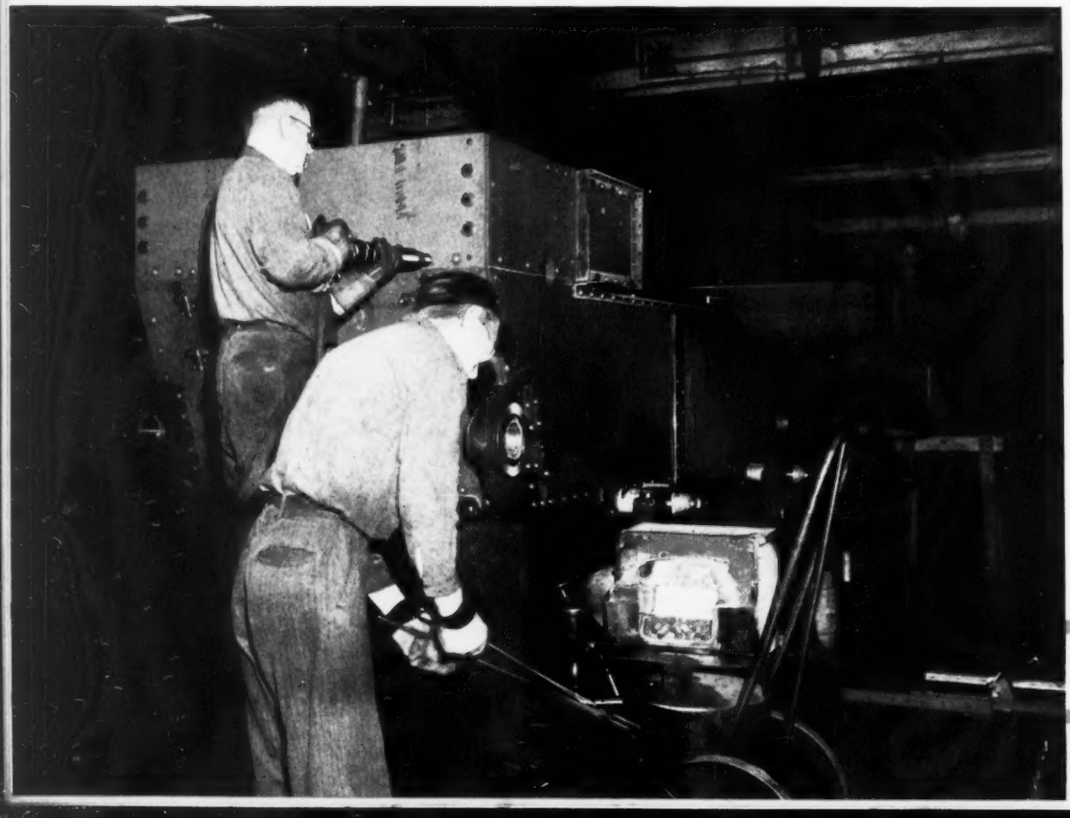


Fig. 2. All Structural Work on the Tanks is Assembled by Riveting. This Illustration Shows Work on another Jig of the Type Seen in Fig. 1

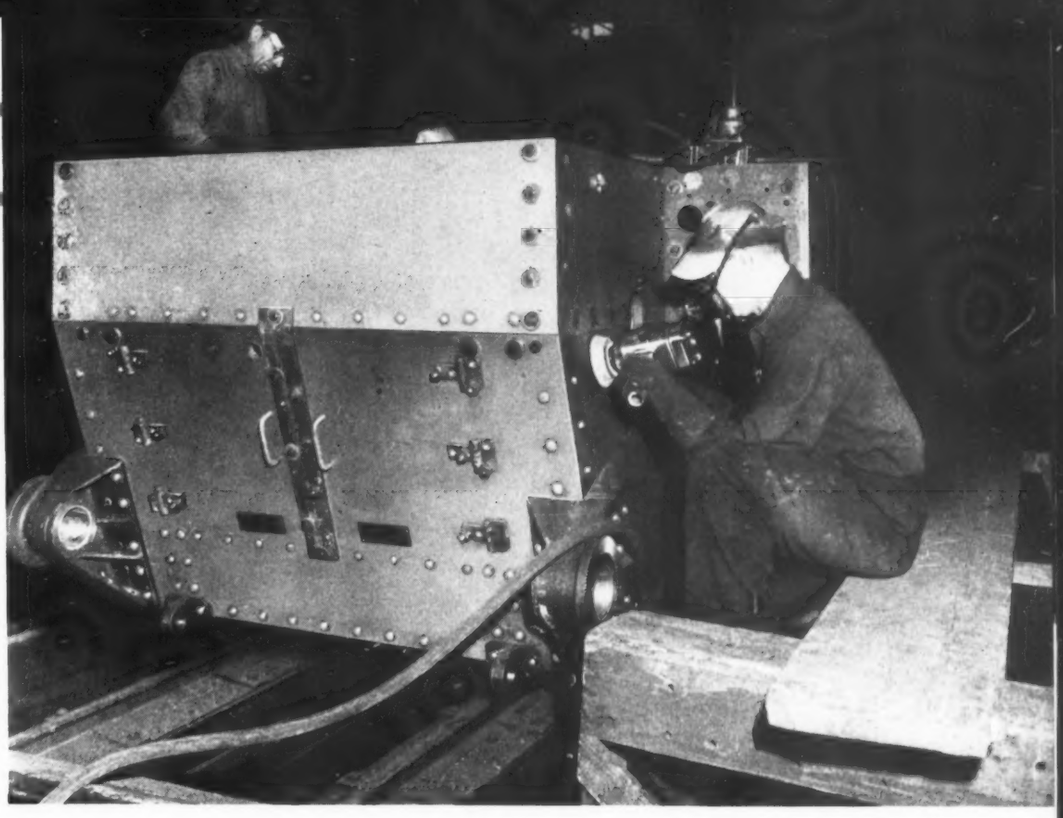


Fig. 3. The Rivet Heads on the Outside of the Tanks which are Driven into Countersunk Holes are Ground Flush with the Armor Plate

through the holes in the armor-plate, so as to insure accurate alignment with the latter holes. The set-up bolts used in this preliminary assembly have a coarse thread to expedite the tightening and withdrawal of the nuts.

At the beginning of the hull assembly line are floor plates equipped with pedestals, as illustrated in Fig. 1, for supporting the front and rear axles and the bottom hull plates while the side plates of the hull are bolted in position ready for riveting together. There are four so-called "jigs" of this type, and they are loaded and their work riveted in pairs, so that two of the jigs are always in process of being loaded while the work in the other two jigs is being riveted together. Riveting is employed exclusively in assembling the armor-plate sections, because welded areas would be vulnerable to gunfire. Over 1500 rivets of nickel steel are driven on each tank.

All riveting is performed with pneumatic tools, a typical operation being shown in Fig. 2. The rivet heads are driven into countersunk holes on the outside of the armor-plate sections, and after cooling, are ground flush with the outside of the

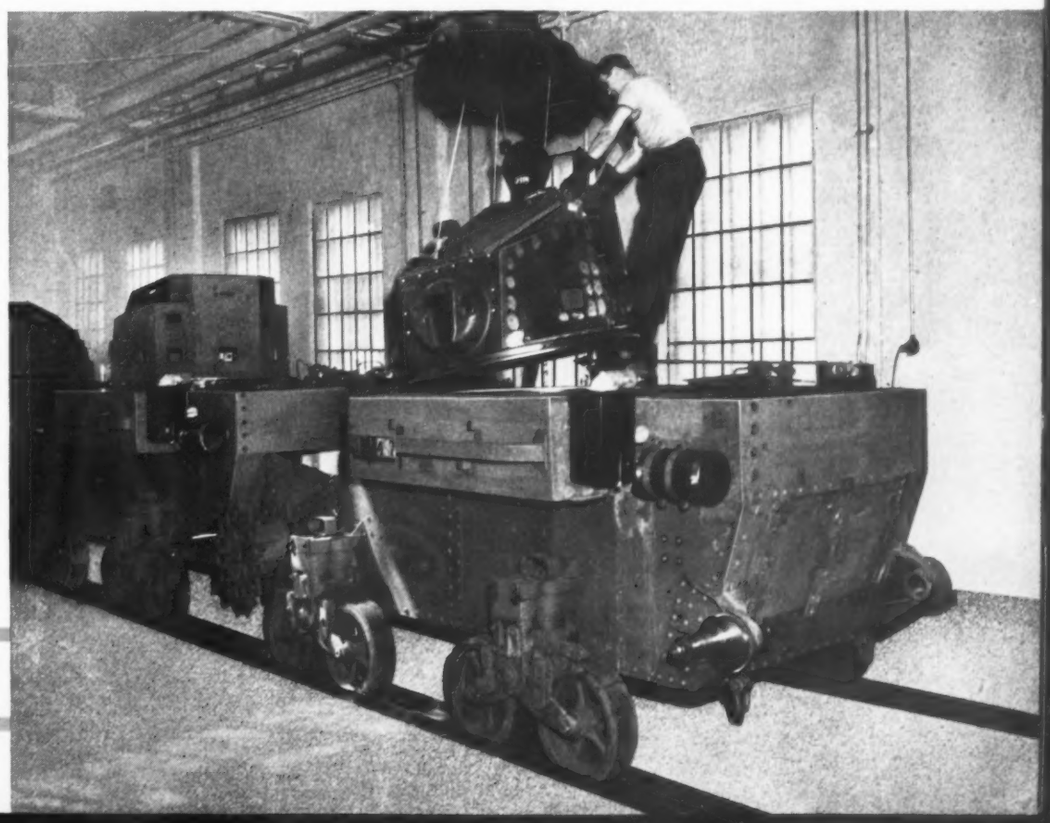


Fig. 4. Turret being Lowered on a Tank Seen along the Final Assembly Line, where the Tanks are Pushed along on the Bogie Suspension Wheels

Fig. 5. Many Castings and Forgings which are Held in Jigs While being Machined are First Ground on a Disk Grinder to Establish Flat Locating Surfaces

armor plate so as to obtain completely smooth surfaces all around the hull and turret. Pneumatic grinders equipped with cup-wheels are used for this operation, as illustrated in Fig. 3.

When grinding of the rivet heads has been completed, the hulls are transferred by an overhead crane to rails mounted on the top of high I-beams. The hulls are then moved progressively along these rails, by means of the crane, to various stations, where the driving and idler wheels and other parts are assembled, including the bogie suspension wheels. The hull assembly is then lowered to floor tracks and rolled along on its own rubber-tired bogie suspension wheels to various assembly stations, and subsequently transferred to the final assembly line.

It is along the final assembly line, 500 feet long, that the engine is installed, the transmission unit put into place, the turret mounted on top (as shown in Fig. 4) and gun mounting, lamps, siren, and other accessories added. Finally, when each tank reaches the end of this line, as seen in Fig. 6, it is rolled on rubber-block tracks which are stretched before it on the floor. The ends of these tracks are then carried around the sprocket-driving, supporting, and idler wheels, and connected. After the idler wheels have been adjusted to obtain the desired tightness of the tracks, the tanks

Fig. 6. At the End of the Final Assembly Line, the Tanks are Pushed on Rubber-block Tracks, the Ends of which are then Carried around the Sprocket, Idler, and Supporting Wheels, and Connected Together

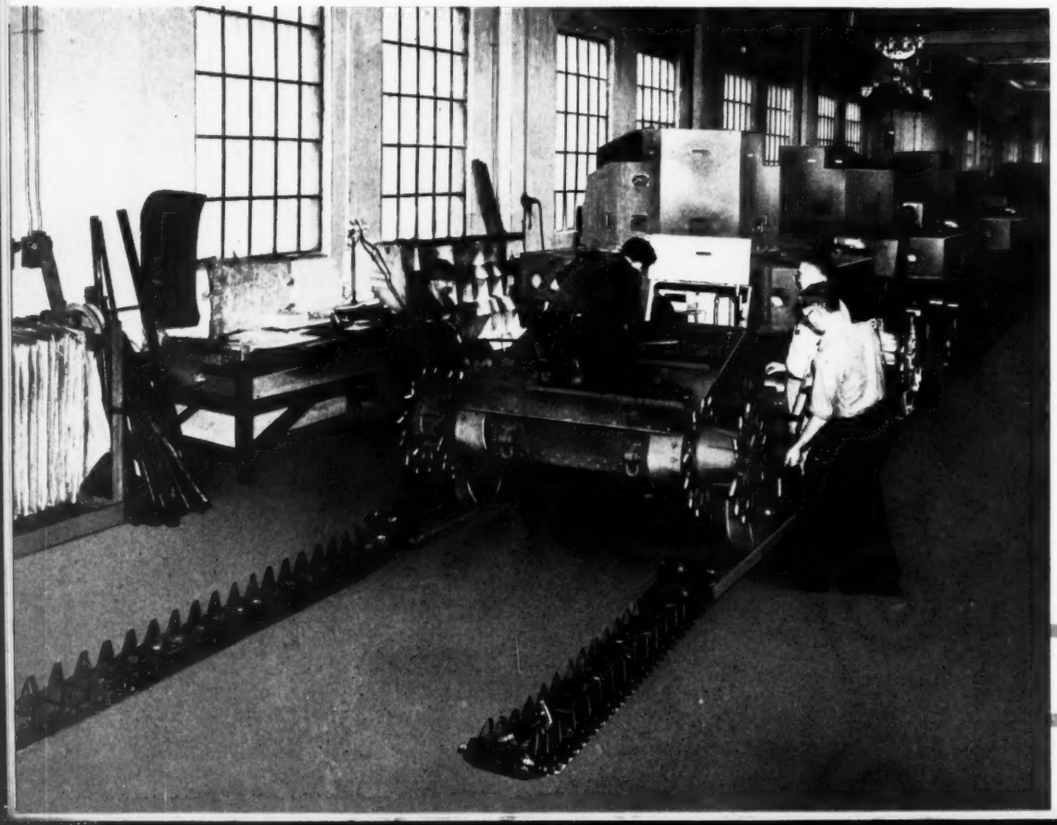


Fig. 7. Finishing the Opposite Sides of Sprocket Wheels, 27 Inches in Diameter, within the Required Tolerance for Parallelism on a Surface Grinding Machine

leave the factory for a road test. Upon their return, they go to the department shown in Fig. 8 to be painted inside and outside, ready for shipment to an Army depot.

Castings and forgings, upon arrival in the machine shop, are first routed to the 72-inch Gardner disk grinder shown in Fig. 5 for establishing locating surfaces used in loading the work-pieces in jigs and fixtures. Cross-bars assist in holding several pieces of work in different grinding positions around the sectional abrasive wheel. A wheel-truing device is provided on a rail that reaches across the machine to the outside of the housing. Abrasive dust is sucked off the wheel by the exhaust system through slanting channels that are cast in the machine housing all the way around the wheel.

Adjacent to the disk grinder is the Blanchard surface grinding machine illustrated in Fig. 7, which is employed for finishing the opposite sides of the sprocket wheels. These sprocket wheels are 27 inches in diameter by 0.8 inch thick. The magnetic chuck is slid in and out by operating a hand-wheel to bring the work into position beneath the grinding wheel and to withdraw it at the end of the operation.

The sprocket wheels are then transferred to the Bullard vertical turret lathe illustrated in Fig. 9

Fig. 8. When the Tanks Return from the Road Test, They are Completely Painted by the Use of Spray Equipment, after which They are Ready to be Shipped to the War Department

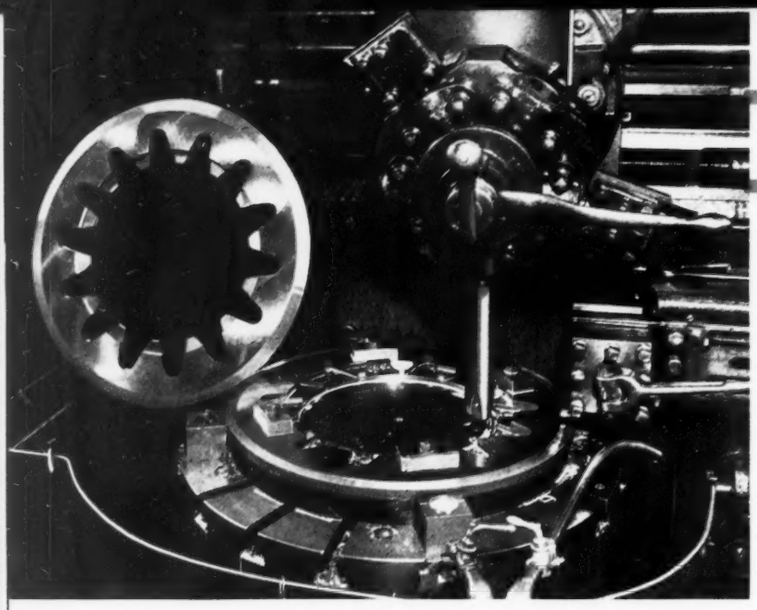


Fig. 9. The Sprocket Wheels are Bored and Counterbored around the Inside of the Teeth and Beveled on the Outer Edge on a Turret Lathe

for taking a wide bevel cut around the edge on both sides, this cut being taken by a tool on the side-head of the machine. The tool is ground to the angle of the bevel and is fed straight in to the work. After one side of the sprocket has been beveled, the work is reversed on the machine table for beveling the opposite side. While the bevel cut is being taken on one side, the tops of the sprocket teeth are bored to the specified diameter, and the center of the sprocket is counterbored. These cuts are taken by tools on the turret.

The teeth on sprockets of another type are machined complete from circular rims on the Kellermatic tool-room machine illustrated in Fig. 10. Two sprockets are mounted on the vertical table for simultaneous machining by a spiral milling cutter about 1 1/2 inches in diameter by 6 inches long. The cutter moves automatically, in and out and up and down, around the sprocket, as controlled by the movements of a tracer around the steel templet mounted above the work-pieces. On some sprockets, the teeth are completely machined in one cut, while two cuts are taken on others. The sprockets seen on the machine in Fig. 10 are 30 inches outside diameter, and have fourteen teeth approximately 1 1/2 inches high.

The teeth on sprockets of the type shown in Fig. 9 are flame-cut over-size to the desired outline before they are brought to the Kellermatic, so that only a comparatively light cut need be taken by that machine.

Each tank is equipped with two idler wheels, one on each side at the rear end, over which the inside of the rubber track passes. These wheels are machined to a smooth surface around the rim, and are also bored to several diameters and faced by a Bullard vertical turret lathe, set up as illustrated in Fig. 12. The wheels are 24 inches outside diameter,

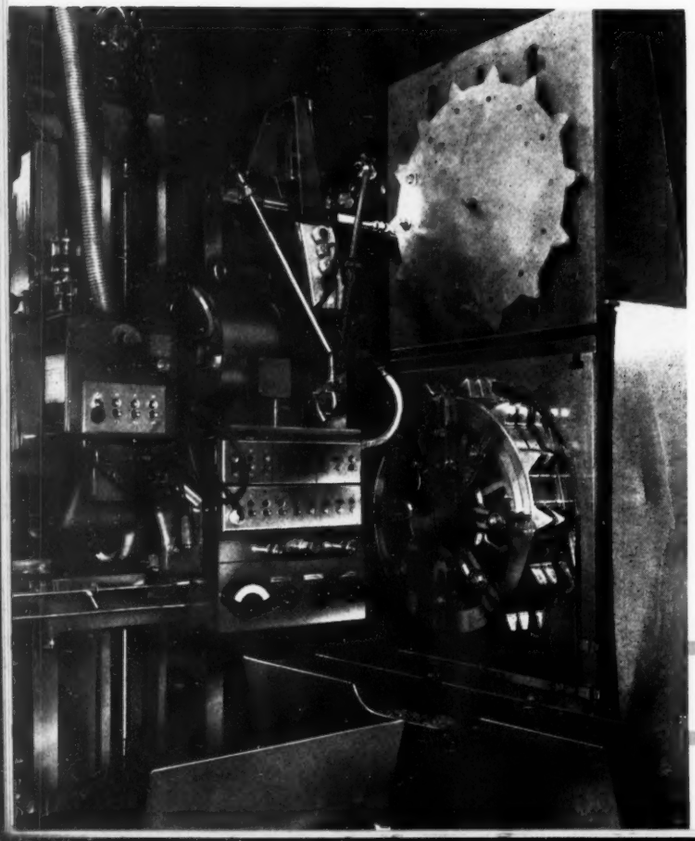


Fig. 10. Simultaneously Machining the Teeth of Two Sprockets on a Kellermatic, the Teeth being Machined Complete from Circular Rims in Either One or Two Cuts

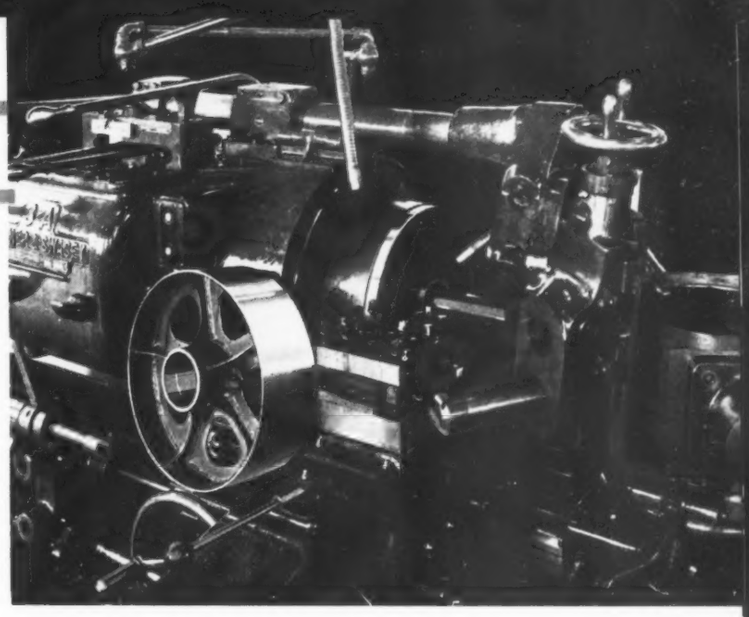


Fig. 11. Bogie Suspension Wheels are Turned and Bored Complete by the Use of a Turret Lathe Equipped as Shown in the Illustration

the rims are 6 inches wide, and the maximum bore diameter is nominally 6 13/16 inches.

The turning and corner-rounding cuts are taken by tools on the side-head, and the boring and facing cuts by tools on the turret. The wheel is held to the table of the machine by means of three clamps, which are tightened on the wheel arms.

Bogie suspension wheels, 16 inches in diameter by 5 1/4 inches wide, are turned and bored on Warner & Swasey 3-A turret lathes equipped as shown in Fig. 11. A rough-turning cut to a depth of 1/8 inch is taken at high speed across the wheel rim by a tool on the front carriage of the machine, and then a light finishing cut is taken to obtain an exceptionally smooth surface. While the turning cuts are in progress, rough- and finish-cuts are taken on the wheel bore and the hub and rim are faced by tools on the turret faces. The wheel is clamped on a fixture mounted on the faceplate.

Solid rubber tires vulcanized on circular steel bands 16 inches in diameter by 6 inches wide are assembled over the bogie suspension wheels by applying the Oilgear hydraulic press shown in Fig. 14. The rubber-tired rims are painted on the inside with white lead, and the rim of the wheel centers is painted similarly for one-half its width. Then the wheel center is located over a simple fixture on the press table and a rubber-tired rim is placed on the wheel and centralized by means of a circular stepped plate attached to the machine ram. When pressure is applied, the rubber-tired rim is forced smoothly down over the wheel, the white lead acting as a lubricant. The press has a rating of 75 tons, but only about 15 tons of pressure need be applied in this operation. The tire is about 3/4 inch wider than the wheel center so that it overhangs 3/8 inch on each side. Both the table fixture and the ram attachment are stepped to suit.

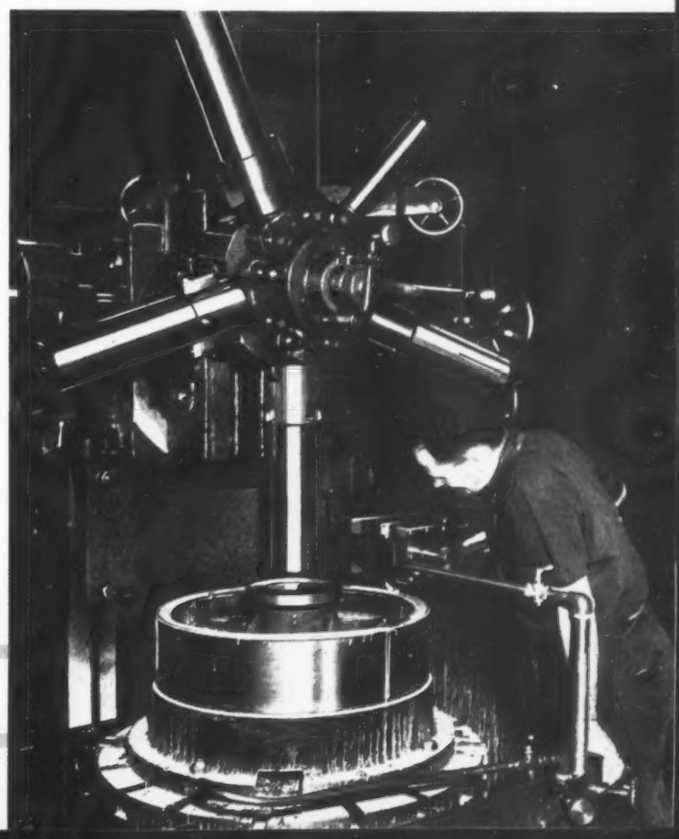


Fig. 12. Turning and Boring Operations on the 24-inch Diameter Idler Wheels are Performed on a Vertical Turret Lathe as Shown in This Illustration

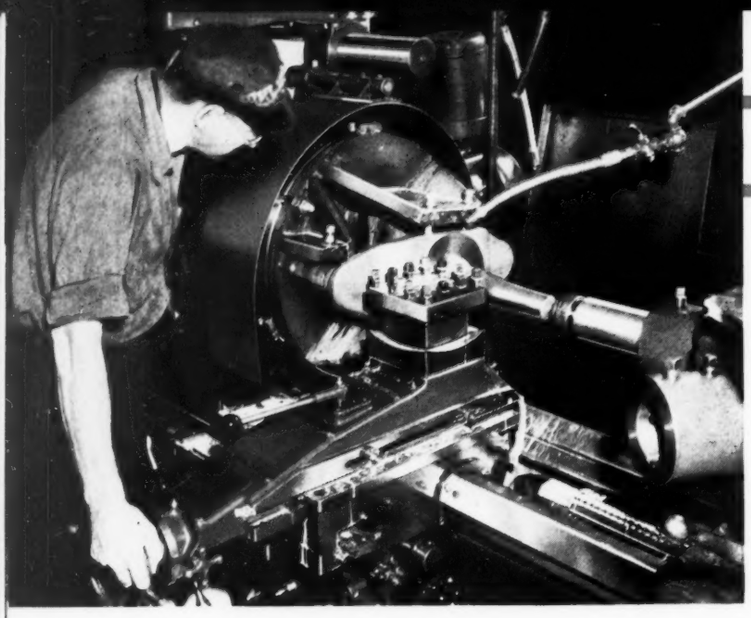


Fig. 13. Turret Lathe in which Straight and Taper Sections are Turned on the Spindle of Bogie Fulcrum Forgings, and a Large Diameter Faced

At the bottom of the tank turrets is a base ring, 53 inches in diameter by 3 inches wide by 3/4 inch thick, on which the turret revolves when assembled to a tank. This base ring must be accurately turned and faced. It is finish-machined on the King vertical boring mill illustrated in Fig. 16. The ring is rough-machined prior to being riveted to the turret.

The face of the base ring consists of a combination flat surface and a wide bevel that extends about two-thirds across the face. A turning cut is taken by a tool on the right-hand head, and then the base is faced by another tool on the same head. A tool ground to the angle of bevel, which is mounted on the left-hand head, is fed straight in horizontally to take a final shaving cut on the bevel. The under side of the base ring is likewise machined to a bevel.

The turret is located on a jig for this operation, and screw jacks are used to support it on the short side. A plate clamped on the inside of the base ring, centralizes the work at the top with the machine and the fixture.

In Fig. 13 is shown a No. 4-A Warner & Swasey turret lathe equipped for machining the spindle of bogie fulcrum forgings. This spindle extends from one side of the forging, which also has two stub axles projecting from the opposite side. In the illustration, the main portion of the forging has just been faced with a tool on the square turret of the carriage preparatory to recessing this face and turning the spindle. Two straight diameters are next turned on the front end of the spindle, then a taper 7 1/4 inches long and a straight section adjoining the recess are machined. The taper cut is controlled by an attachment at the front of the turret lathe bed. The heavy end of the forging is held in a box type fixture on the machine headstock, and the overhanging end of the spindle is supported by a ball-bearing center on the tailstock.

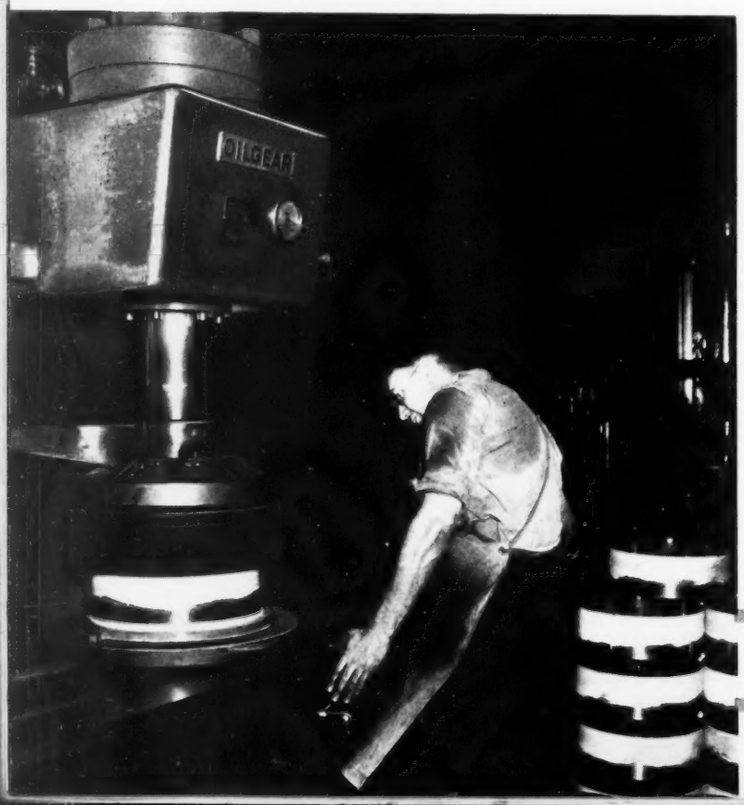


Fig. 14. Solid Rubber Tires Vulcanized on Steel Bands are Assembled on the Bogie Suspension Wheels by Applying a Hydraulic Press

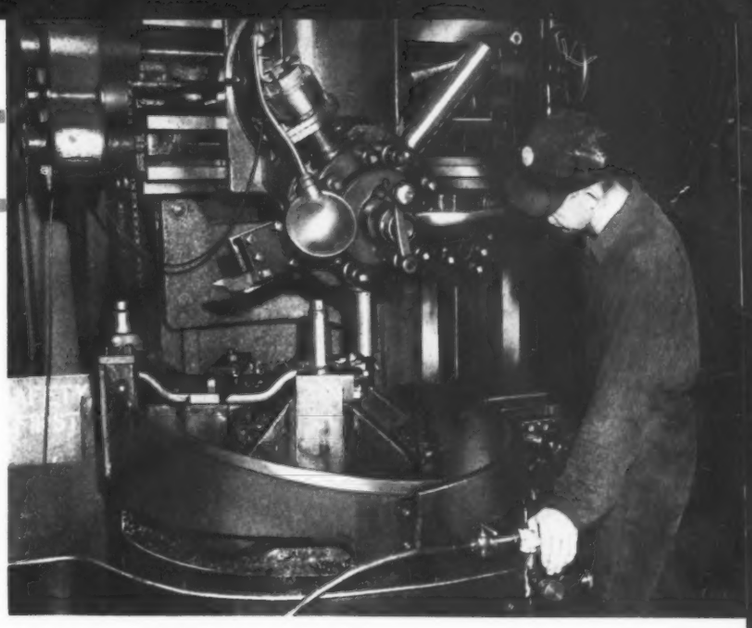


Fig. 15. Machining Two Stub Axles on the Bogie Fulcrum Forgings on the Side Opposite the Spindle Machined as Illustrated in Fig. 13

The next operation on this part consists of machining the opposite two stub axles on the Bullard vertical turret lathe illustrated in Fig. 15. This machine is provided with a heavy fixture for holding either stub axle directly in the center of the machine. When the first axle has been machined, the work-piece is reversed in the fixture for finishing the second stub axle.

The part is located in the jig from the previously machined spindle on the opposite side of the forging. The surface of the work adjacent to each axle is accurately faced by setting a side-head tool from a locating surface on the fixture. Turning cuts on the axle are then taken by tools on the turret, which is also provided with a tool for facing the end of the axle and with a die-head for threading it.

The machine shop is equipped with several boring mills of the horizontal type. A typical operation on a Universal machine of this type is illustrated in Fig. 17. It consists of machining the bore in the center of suspension link forgings from solid stock.

The first step consists of drilling a hole 1 inch in diameter through the piece, the drill being accurately guided by a collar on the spindle which enters a bushing on the right-hand end of the work fixture. This hole is then enlarged by a drill slightly under the finished size, which is guided similarly to the smaller drill. Finally, the hole is finished by a reamer on an arbor that is provided with collars both in front and back of the tool, which register in bushings on both ends of the fixture.

Several pieces of Nitralloy steel are machined by turret lathes. In Fig. 18 is illustrated a Warner & Swasey machine equipped for drilling, boring, reaming, and facing suspension plugs forged from that material. The shank end of the plugs is turned prior to this operation, also on a turret lathe.

In the operation shown, the work is located on

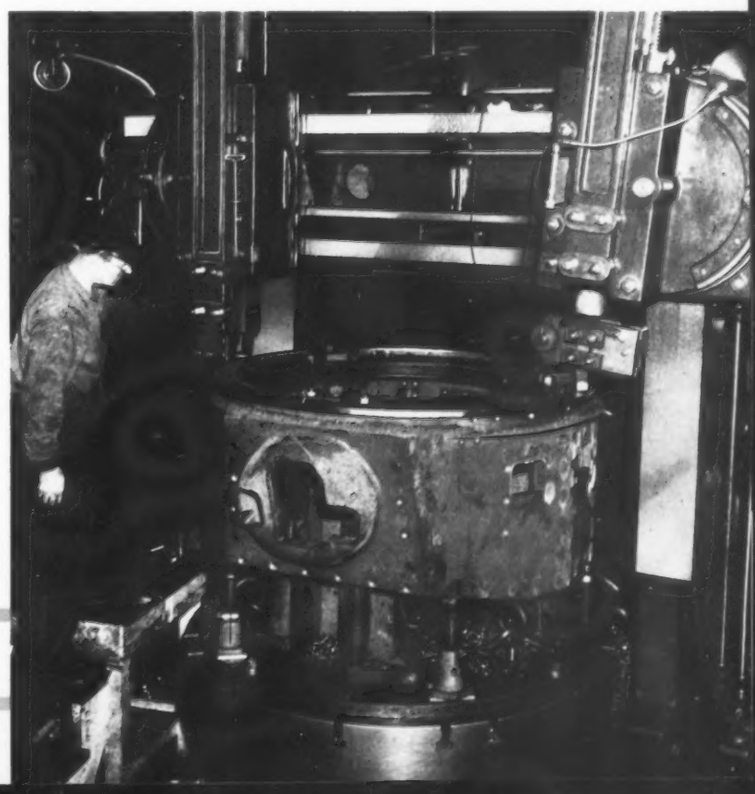


Fig. 16. The Base Ring on the Bottom of the Tank Turrets is Turned and Bored within Specified Tolerances on a Vertical Boring Mill

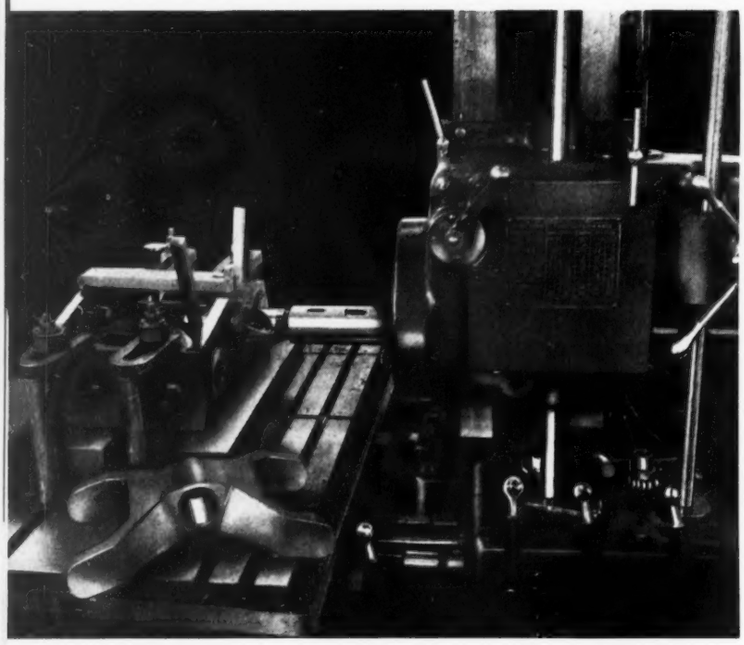


Fig. 17. Employing a Horizontal Boring Mill for the Drilling and Reaming of Accurate Holes through Suspension Link Forgings

a headstock fixture from the turned shank. Then the square end of the plug is center-drilled, drilled straight through in two steps, bored in two steps, and reamed by tools on the turret. A cutter on one of the boring-bars chamfers the hole on one end.

Milling on a production basis is carried out on a variety of parts by employing the Cincinnati duplex milling machine shown in Fig. 19. The particular operation illustrated consists of simultaneously finishing the opposite ends of cast-steel suspension brackets. Four of these castings are held on the table fixtures. Two inserted-blade face-milling cutters of 10 inches diameter are mounted on the opposed spindles of the machine.

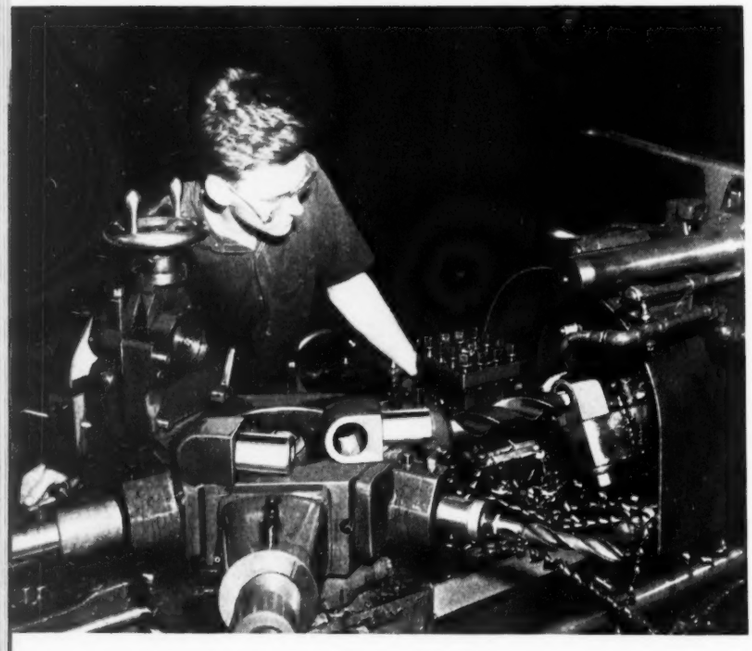


Fig. 18. Turret Lathe Operation in which Suspension Plugs Forged from Nitralloy Steel are Drilled, Bored, Reamed, and Faced at High Rates of Production

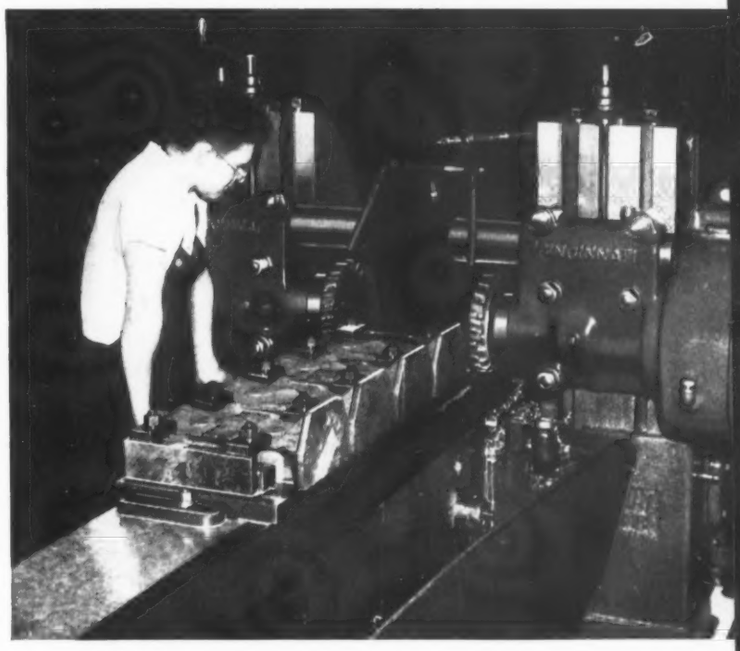


Fig. 19. Duplex Milling Machine Employed for the Production Milling of Large Flat Surfaces on the Ends of Suspension Bracket Castings

An unusual application of a Continental Do-All sawing and filing machine is illustrated in Fig. 20. This operation consists of sawing the irregular outline on the large open end of a cone-shaped suspension part. The part is mounted on a wooden fixture to which blocks are attached on the under side for registering with the edge of the table, in order to locate the work for the successive cuts. The work is fabricated from plate steel 1/4 inch thick.

This article demonstrates the fact that the American metal-working industry is actually the Nation's first line of defense, because it is that industry that produces the tanks, guns, shells, airplanes, and battleships used by our armed forces.

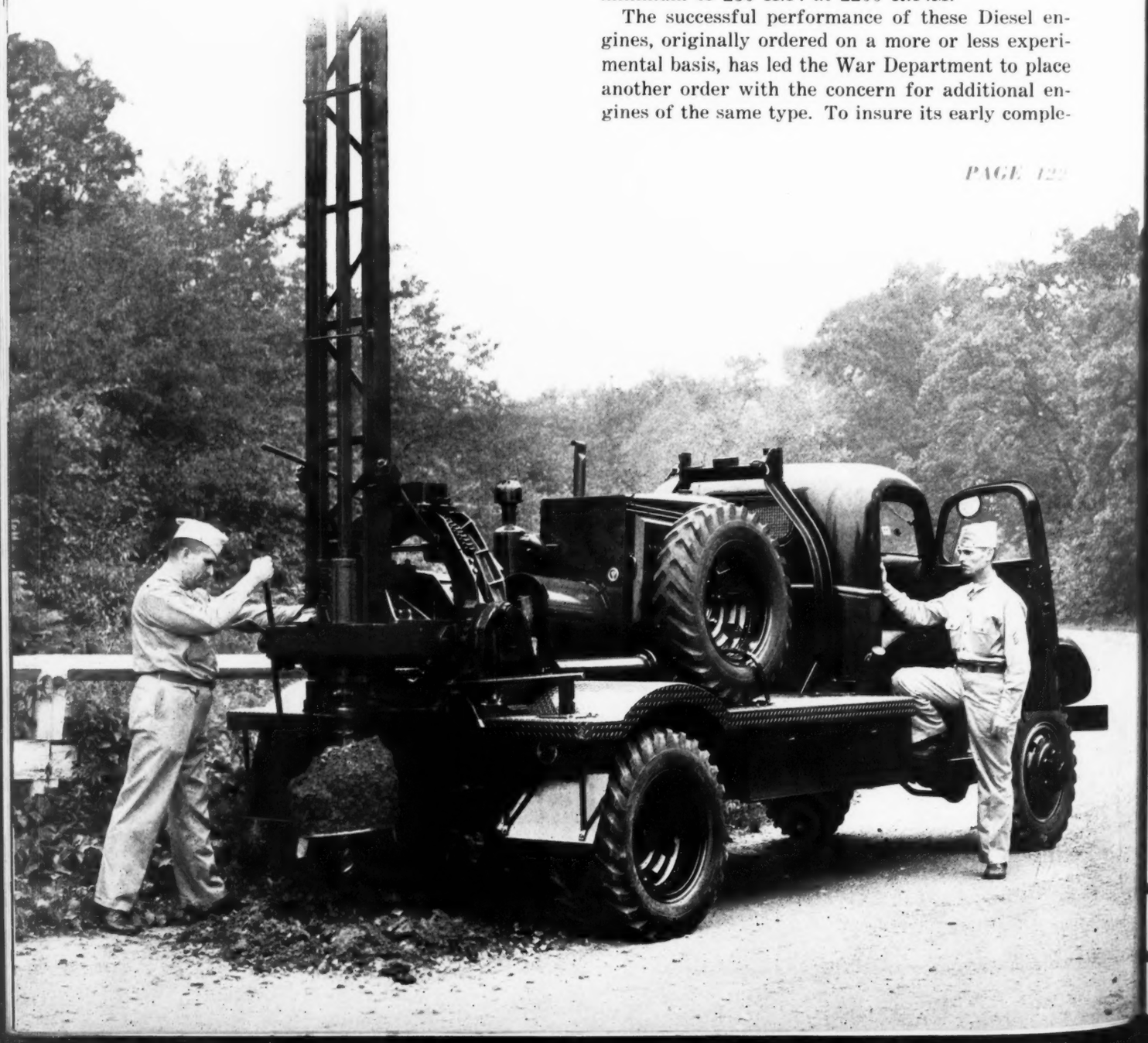
Fig. 20. Application of a Do-All Sawing and Filing Machine for Cutting an Irregular Outline on the Large Open End of a Cone-shaped Suspension Part Used on Tanks

★ Diesel Tank Engines and

Equipment and Methods Employed by the Buda Company in Turning out Diesel Engines for United States Army Tanks and Earth-Drilling Equipment for the Army

SOME months ago, the Buda Company started manufacturing Guiberson Diesel engines to be used in driving United States army tanks. These engines are of the air-cooled radial design shown in Fig. 1, and of the same general construction as engines built by the company for aviation applications, except that they are equipped with a special fan, shrouding, and baffles that insure efficient cooling of the engines when operated over long periods of time in the comparatively small tank compartments in which they are installed. These engines have nine cylinders and develop a minimum of 250 H.P. at 2200 R.P.M.

The successful performance of these Diesel engines, originally ordered on a more or less experimental basis, has led the War Department to place another order with the concern for additional engines of the same type. To insure its early comple-



Motorized Earth Drills ★

tion, the company has erected a new building with a floor space of approximately 47,000 square feet, which will be fitted out almost entirely with new machine tools and other equipment for the manufacture, assembly, and testing of tank Diesel engines. Part of this building was erected last spring, and has been in operation for several months. This plant extension is costing about $900,000.

Another contribution of the Buda Company to the Defense Program consists of supplying Buda-Hubron earth-drilling equipment for the constructive and destructive activities of an army in time of war. These drills are capable of cutting holes in earth up to 3 1/2 feet in diameter and 24 feet deep—with a special arrangement, they can be built for drilling to a depth of 50 feet.

These earth drills are especially intended for such operations as the drilling of holes underneath roads, bridge foundations, railroads, etc., preparatory to the placing of explosives, land mines, and anti-tank traps. The manner in which these earth drills are applied will be apparent from the typical application illustrated on the opposite page. A hole 20 inches in diameter can be drilled to a depth of 6 feet in ordinary soil and soft rock within three minutes, and to a depth of 20 feet within twenty minutes. Holes can be drilled at any angle from the vertical up to 45 degrees sidewise in relation to the truck platform on which the drills are mounted, and up to 15 degrees forward or backward in relation to the truck.

These earth drills are driven by a four-cylinder water-cooled gasoline engine of 40 H.P. rating which is also built by the Buda Company. The motor trucks on which the earth drills are mounted are supplied by one of the large automobile companies, equipped with steel platforms designed especially for the installation of the earth-drilling equipment. When an earth drill is being transported, the drive from the engine to the drill spindle is disconnected and the boom is swung into an almost horizontal position forward over the cab.

This article will deal specifically with typical operations in machining parts for the Diesel tank engines and the earth drills. One of the latest machine tools to be installed is the Gisholt turret lathe shown in Fig. 2, which is employed for facing one side of the flange on cylinder barrels and for polishing a large fillet where the opposite side of the flange joins the body of the barrel. This operation is performed after the cylinder barrel has been ground. The barrel is carefully seated for the operation on a split mandrel sleeve attached to the headstock spindle, and the back end of the barrel is supported by a live roller-bearing tailstock center.

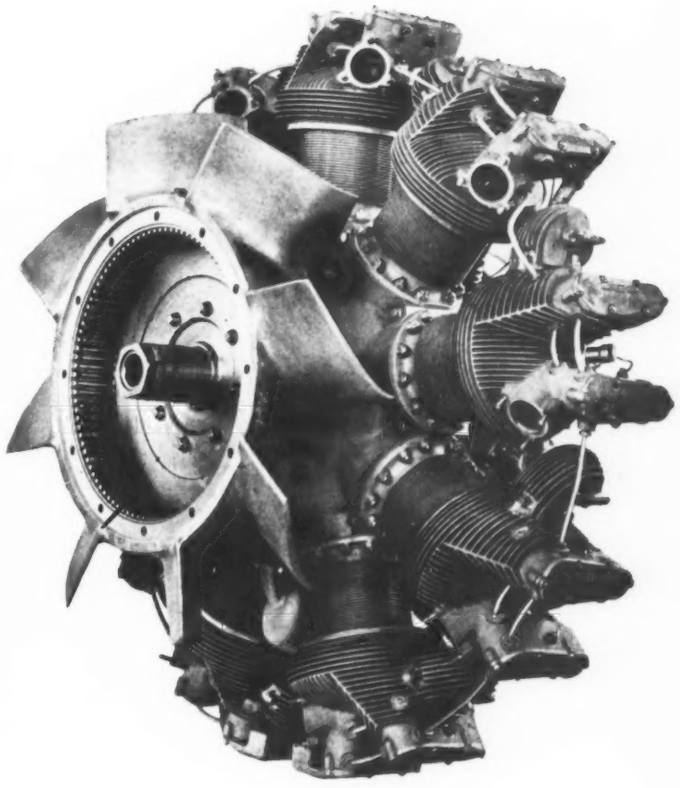


Fig. 1. Radial Type of Diesel Engine Produced by the Buda Company for Driving Army Tanks, Shown with the Special Fan, but without the Shrouding and Baffles

The facing cut is taken by a tool on the square turret at the front of the cross-slide. The flange must be finished within 0.001 inch of the specified length, and also within a corresponding tolerance as regards its right-angular relation with the bar-

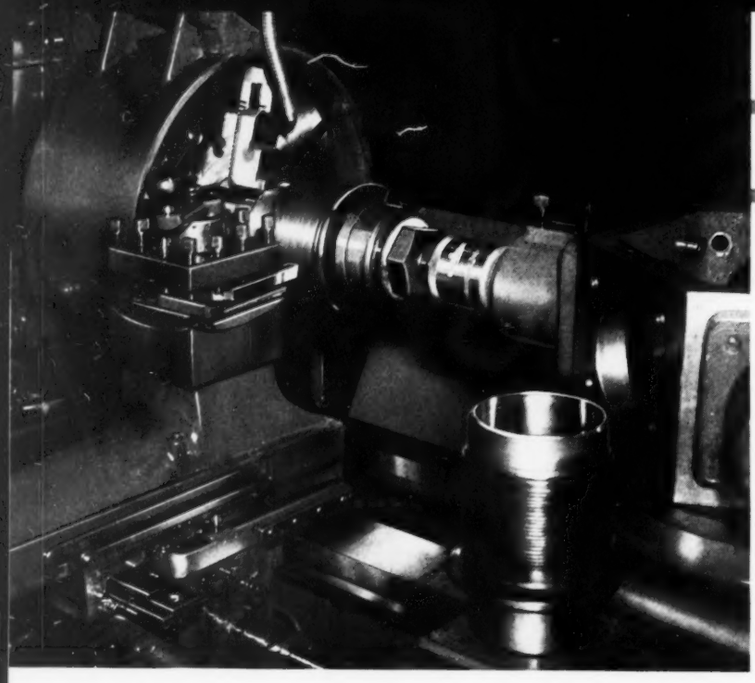


Fig. 2. Set-up for Facing the Flange on Cylinder Barrels for Diesel Tank Engines and Polishing a Fillet on Opposite Side of Flange

rel bore. The facing cut is of prime importance, because this flange surface locates each cylinder assembly in the crankcase, and has an important effect on the compression obtained in the cylinder.

When the facing cut has been completed, the square turret is indexed to bring a blunt-nosed tool toward the work. As this tool is advanced, the operator holds a piece of emery cloth in front of the tool for polishing the fillet previously mentioned. This surface must be given a high polish, so as to eliminate any minute scratches which might possibly enlarge after the engine has been placed in service and cause cylinder failure. This turret lathe is also employed for a variety of other work in which tools are employed on both the hexagonal and square turrets.

External threads are later produced on the cylinder barrels by employing the Hall planetary milling machine shown in Fig. 3, which is equipped with eighteen form cutters arranged around a circular path on a holder mounted on the headstock spindle. In this operation, also, the cylinder barrel is slipped on a split sleeve, so as to insure accurate relation of the threads to be cut with the ground cylinder bore. The split sleeve is contained within a fixture that advances the work into the operating position through the action of a hydraulic cylinder and withdraws it upon the completion of the cut.

In this operation, the work remains stationary while the form cutters rotate eccentrically around it to mill the thread, as is conventional practice with this type of machine. The front end of the work-carrier is made with a taper nose to fit a taper seat on the headstock fixture on which the

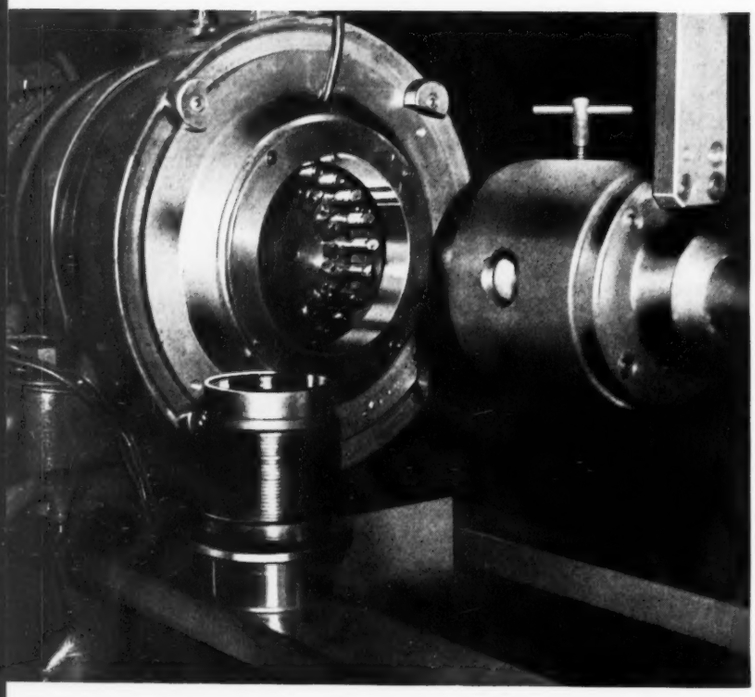


Fig. 3. (Center) Milling External Threads on Cylinder Barrels for Diesel Tank Engines on a Hall Planetary Milling Machine

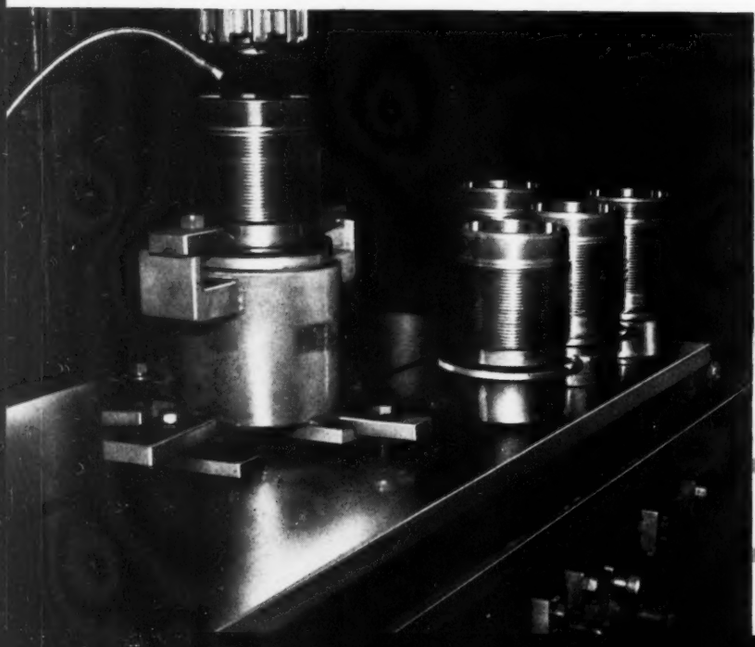


Fig. 4. (Left) The Cylinder Barrels for the Diesel Tank Engines are Honed to Specified Diameter within Plus or Minus 0.0004 Inch

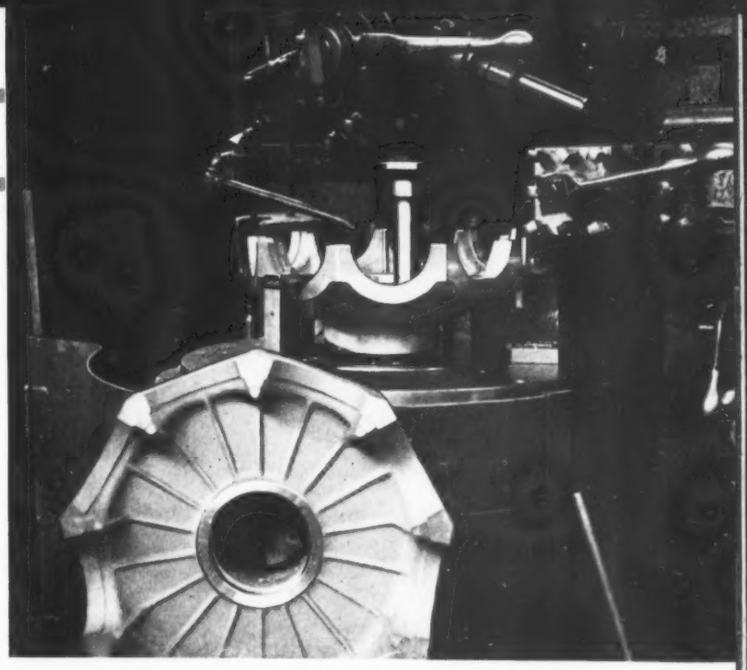


Fig. 5. Vertical Turret Lathe Engaged in Taking Boring and Facing Cuts on the Front Section of a Crankcase

tools are mounted, thus insuring accurate location of the work in relation to the cutters. The pitch diameter of the thread produced must be between 5.4874 and 5.4895 inches, there being twelve threads per inch for a width of 1 1/64 inches.

The cylinder barrels are honed in the Barnes single-spindle honing machine illustrated in Fig. 4, which is equipped with a fixture designed to hold the barrel from the ground skirt that extends in front of the flange. The flange is clamped down on the fixture. In this operation, the cylinder bore is finished to 5.125 inches plus or minus 0.0004 inch, the length of the cylinder barrel being 9 inches. The lubricant employed is a mixture consisting of two-thirds Diesel engine oil and one-third of a heavier oil (International Compound).

The application of an American radial drilling machine for drilling, boring, and reaming the valve-guide and valve-stem holes in cylinder heads is shown in Fig. 8. The work is placed in a jig that is free to slide on the vertical face of a base member, so that the work can be indexed into two positions to bring the intake and exhaust chambers of the cylinder head successively into line with the vertical drill spindle of the machine. In indexing, the operator moves a lever to withdraw a locking pin from a dowel-hole in the vertical face of the base, and the jig is then slid around a curved track on the vertical face. There are, of course, two dowel-holes to insure accurate holding of the jig in both indexed positions.

The work is located in the jig from its upper flange surface, which is seated in a hardened and ground ring and clamped there by the operation of a lever underneath the work. This lever turns an

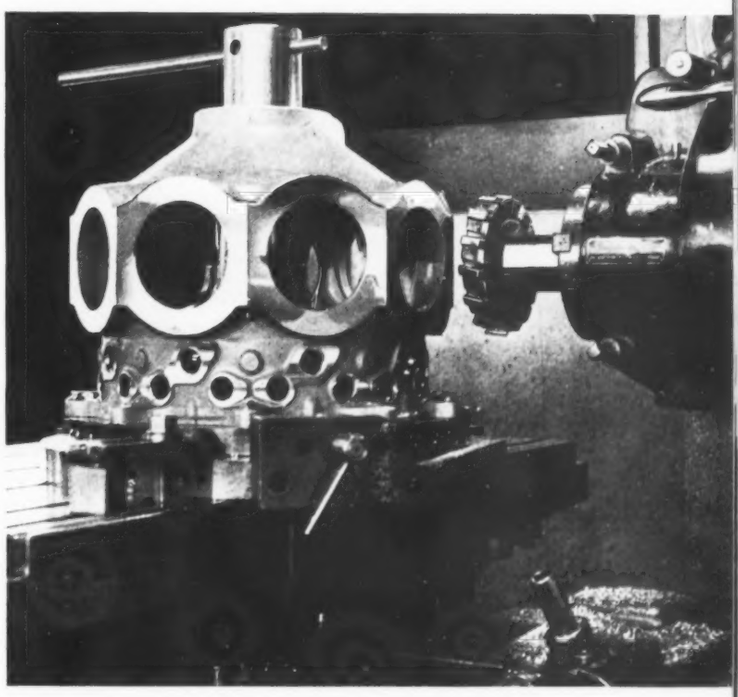


Fig. 6. (Center) Horizontal Boring, Drilling, and Milling Machine Used for Milling and Boring the Crankcases

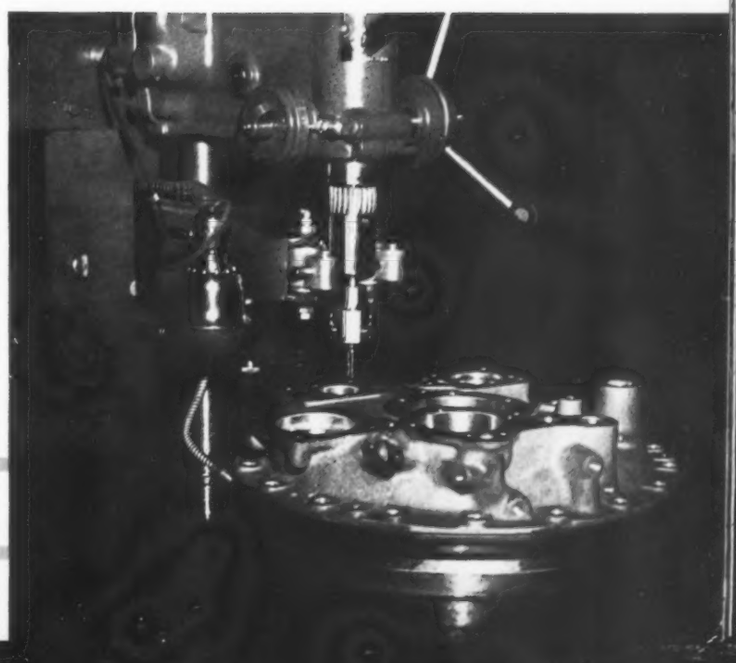


Fig. 7. (Right) Precision Tapping Machine Applied to Cutting the Threads in Twenty-six Holes of Accessory Cases

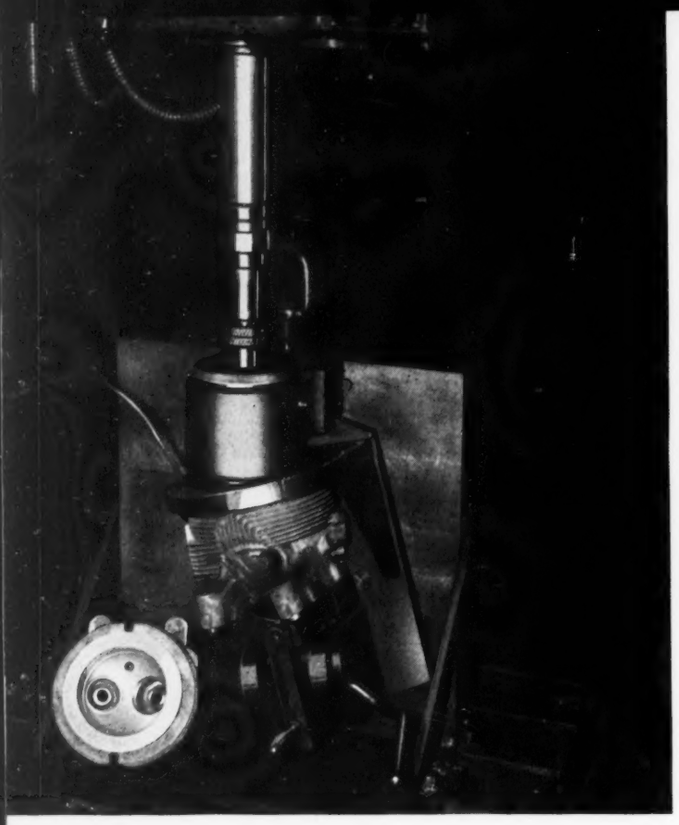


Fig. 8. Jig of Unique Design Employed in Connection with a Radial Drilling Machine for Machining the Valve-guide and Valve-stem Holes in Cylinder Heads

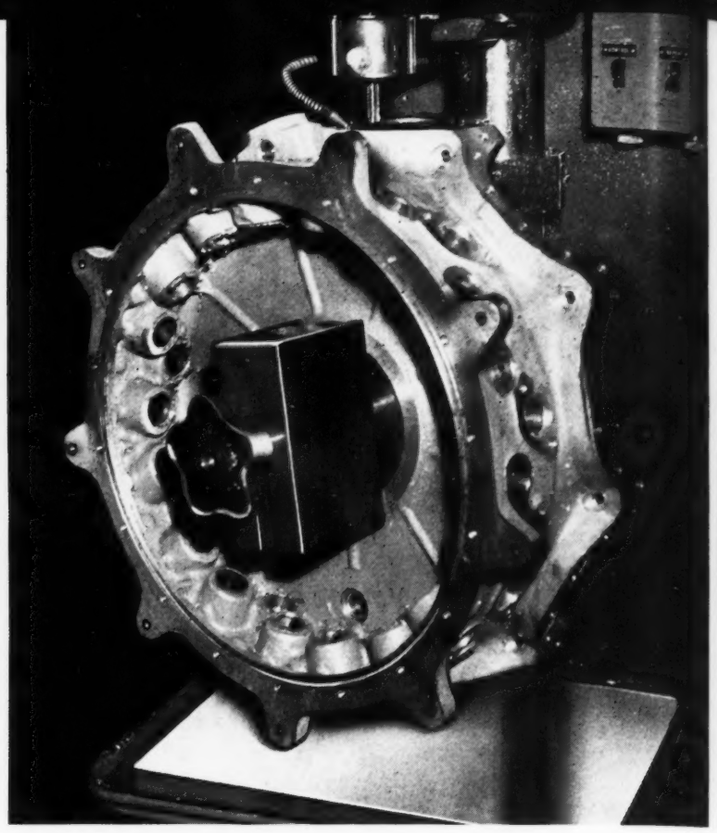


Fig. 9. Precision Tapping Machine Employed for Producing the Threads in the Fifty-four Holes in the Cylinder-sleeve Contact Faces of Each Crankcase Section

eccentric shaft which lifts a two-arm bracket against the bottom of the cylinder head. A large bushing is provided at the top of the jig to guide all tools employed in this operation, there being a corresponding pilot sleeve on the drill spindle in back of the tools.

In Fig. 5 is shown a Bullard vertical turret lathe used for taking boring and facing cuts on crankcase sections. The operation illustrated consists of machining the front crankcase section, boring the large hole seen uppermost in the center of the work and then counterboring the hole to obtain a narrow shoulder near the bottom end. The limits on the two diameters are plus zero minus 0.001 inch. At the same time that these operations are being performed, the legs of the crankcase section are faced by a tool on the side-head, and then bored to obtain a narrow shoulder that will fit closely on a similar turned surface on the rear crankcase section. The bored shoulder of the legs must be 17.500 inches in diameter within plus 0.005 inch minus zero.

At the completion of this operation, the work is turned end for end for boring a hole in the center

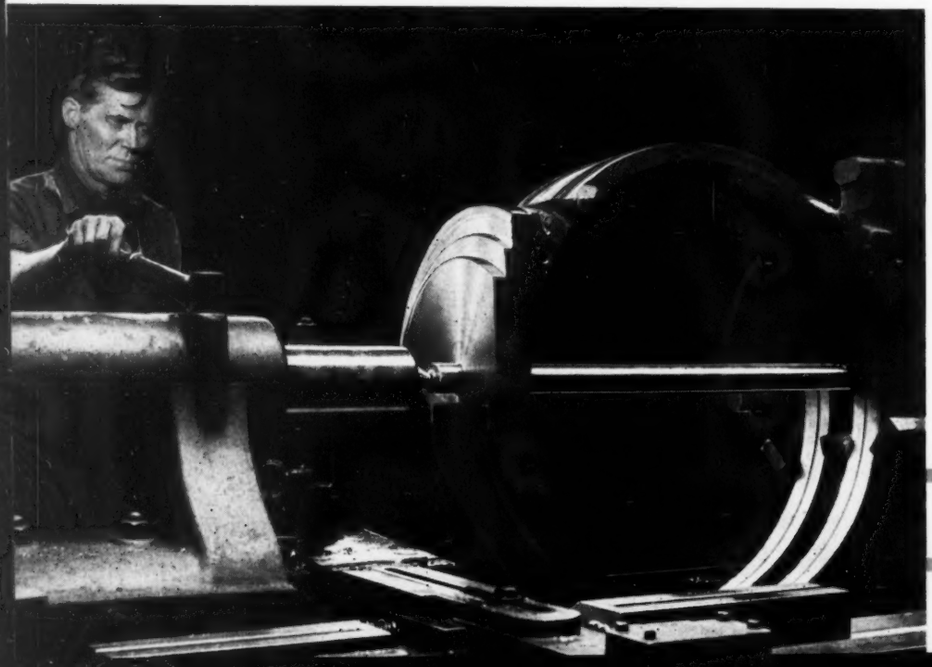


Fig. 10. Facing and Turning Various Surfaces on the Ends of a Cradle Outer Race for an Earth Drill

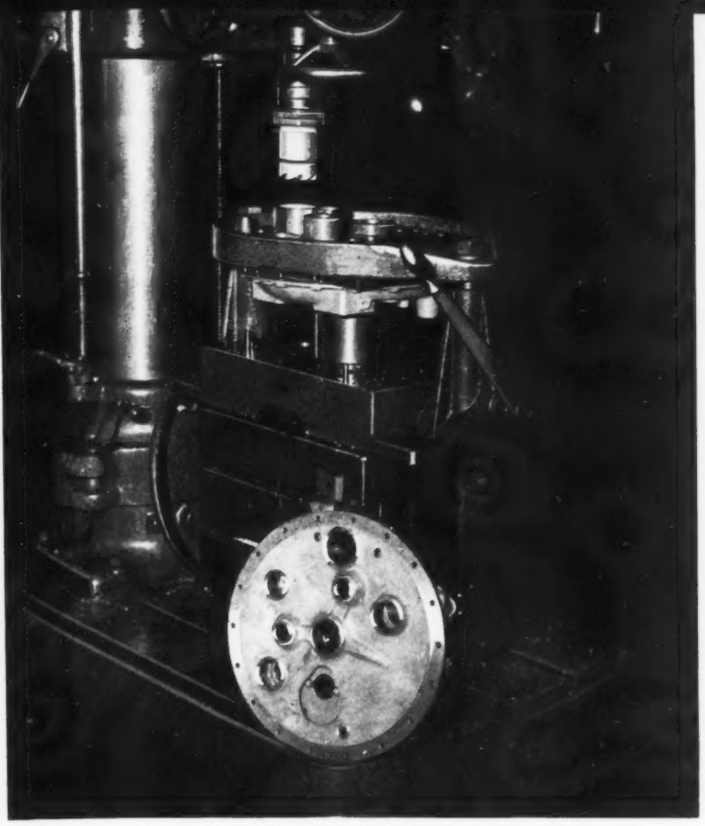


Fig. 11. Radial Drilling Machine Employed for Taking Rough- and Semi-finish Boring, Reaming, and Facing Cuts on Various Holes in Accessory Cases

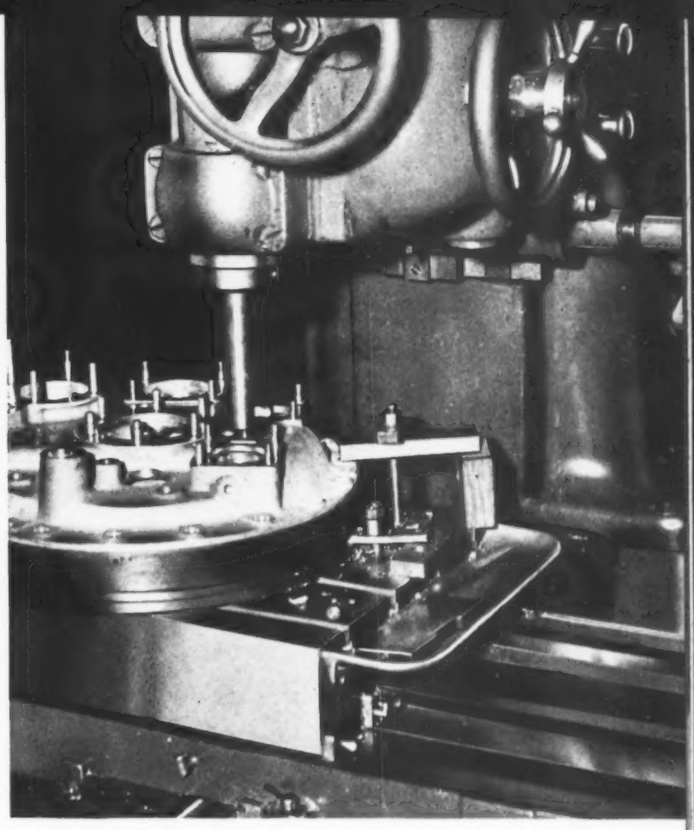


Fig. 12. Employing a Jig Boring Machine for the Performance of Unusually Accurate Boring, Counterboring, and Facing Cuts on Accessory Cases

of the casting from the opposite end; the diameter of the hole must be maintained within a tolerance of 0.001 inch. Vertical and horizontal turret tools are used for all of the boring cuts.

After the two crankcase sections have been bolted together, they are milled and bored to receive the cylinder assemblies. This operation is performed on the Giddings & Lewis horizontal boring, drilling, and milling machine shown in Fig. 6. The illustration shows the machine engaged in milling the large sides of the crankcase to which the cylinder barrels are later bolted, the 7 1/2-inch cutter milling across the entire width of these sides. Small surfaces have previously been milled near the bottom of the crankcase around openings for the fuel injectors and the push-rods. Later, in boring the holes for the cylinder barrels, the boring-bar is guided by a bushing in the center of the fixture. Dowel-holes around the fixture base insure accurate location of the crankcase in each of its twenty-seven indexed positions.

After this operation, the crankcase is disassembled to enable additional machining operations to be performed. One of these subsequent operations

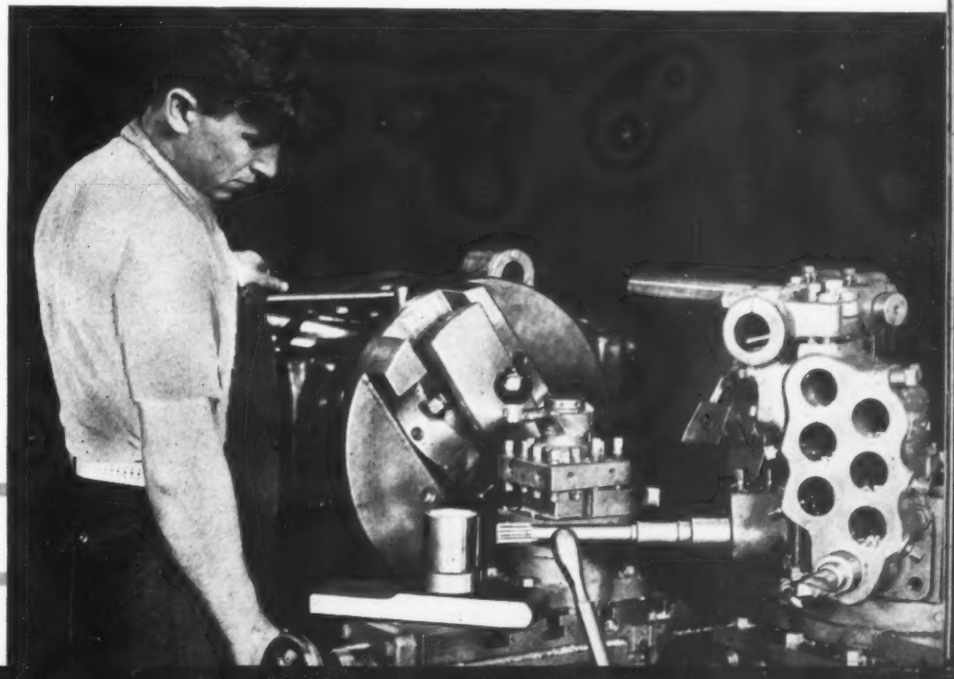


Fig. 13. Turret Lathe Set-up for Boring, Drilling, and Reaming the Crankpin Hole in Diesel Engine Crankshafts

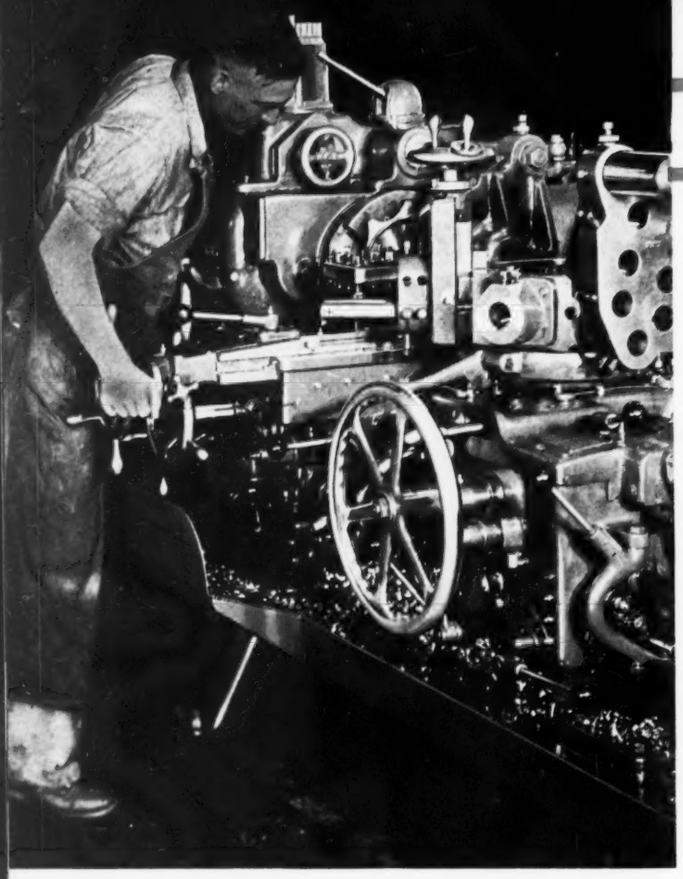
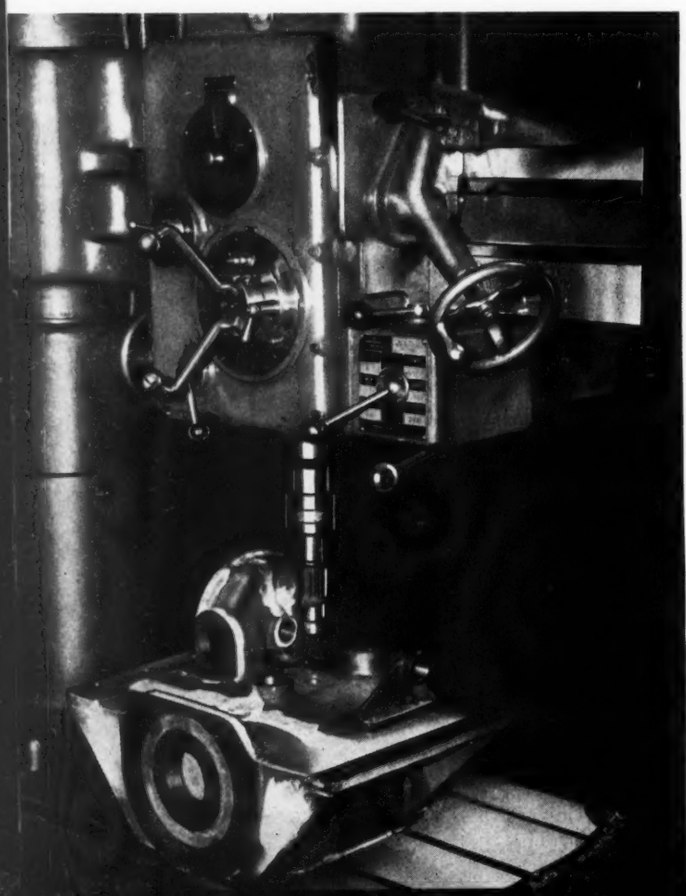


Fig. 14. Another Turret Lathe Used for Taking Turning, Facing, and Boring Cuts on Decompression Plates

Fig. 15. Set-up for Drilling, Boring, Counterboring, Reaming, and Tapping Gear Housings for Earth Drills



consists of tapping fifty-four holes around the cylinder-sleeve contact faces of each crankcase section by employing the Bakewell precision tapping machine shown in Fig. 9. The lead-screw and mating threaded plugs that control the feed of the tap into the work insure Class 3 fits of all holes tapped by the machine. Mounted at the front of this machine is a work-fixture provided with a large round plug at the upper end against which the half-bores for the cylinder barrels are successively clamped for tapping the holes surrounding the half-bores. The holes tapped are 7/16 inch in diameter and have fourteen threads per inch.

Adjacent to this precision tapping machine is another machine of the same type used for tapping twenty-six holes in accessory cases. The accessory cases are merely placed on the flat table of this machine, as shown in Fig. 7, and shifted beneath the tapping spindle as required. The majority of holes tapped in this part are 5/16 and 3/8 inch in diameter.

Various holes in the accessory case must be machined to close center distances, in most instances the limits being only plus or minus 0.001 inch. These holes are produced by the American radial drilling machine illustrated in Fig. 11, the required center-to-center accuracy being insured by the provision of a suitable jig. Small holes are drilled around the flange of the accessory case, and then rough-boring, semi-finish-boring, and reaming cuts are taken in two of the holes near the center of the casting for the shafts of the idler and intermediate gears. The governor-locator hole and the pump hole near the center of the accessory case are also rough-bored and semi-finish-bored. Four bosses within the casting are also rough- and finish-spot-faced by using cutters similar to that seen on the drill spindle. In the various boring and spot-facing steps, the tools are guided by a sleeve on the spindle which enters bushings on the fixture.

The governor-locator hole in the accessory case is afterward bored and counterbored, and the pump hole directly opposite is finish-bored and faced on the Pratt & Whitney jig boring machine illustrated in Fig. 12. The facing operation must be performed within a limit for depth of 0.003 inch. An American radial drilling machine is shown in Fig. 15, being employed for drilling, boring, counterboring, reaming, and tapping various holes in a gear housing for an earth drill.

A Cincinnati Hydromatic milling machine of double-head design is set up for simultaneously milling the four bosses on connecting-rods for the engine used in driving the earth drill. The connecting-rod is held upright in the fixture, with the lower end seated in a V-block and the upper end held by a clamp that is actuated through an air cylinder arranged with a vertical piston and rod. When the piston is moved upward, a lever pushes the front end of the clamp downward to tighten it on the work.

In Fig. 10 is shown an engine lathe being used for taking facing and turning cuts on the ends of a large steel casting which serves as the cradle outer race for the earth drill. This piece measures 38 inches over all. Roughing and finishing cuts are taken on three faces at one end and on three shoulders or steps. Two faces and one shoulder at the opposite end are then machined.

A Jones & Lamson turret lathe employed for machining crankshafts for the tank engines is illustrated in Fig. 13. This operation consists of boring, drilling, and reaming the crankpin hole in one end of the part, with the work mounted in a special fixture on the headstock. In Fig. 14 is shown a Warner & Swasey turret lathe turning, facing, and boring decompression plates.

In the assembly of the Diesel tank engines, use is made of a series of special trucks to which one crankcase half is bolted, and the other parts and units are gradually assembled as the trucks move through the department. The top or table of the truck can be indexed about a complete circle for the convenience of the assemblers, and several hoists of 1-ton capacity are provided on overhead tracks, as illustrated in Fig. 16, so that the entire assembly can be lifted from the trucks, if desired, for the attachment of certain parts.

Fig. 16. View Along Assembly Line, Showing Application of a 1-ton Chain Hoist for Lifting an Engine Assembly

When the engines have been completely assembled, they undergo the same stringent tests as are conducted on aircraft engines. After the first run-in test, which lasts five hours, the engines are taken apart completely and all working parts inspected for signs of wear or unsatisfactory performance. They are then reassembled and again put through tests to determine the horsepower output at various speeds, oil consumption, etc. A Toledo scale indicates the loads being applied on the engine propeller shaft at various speeds, from which the horsepower ratings are computed.

A Safe-Building Plant Turns to A

Building for National Defense in a Plant that Heretofore Specialized in Manufacturing Safes and Bank-Vault Doors

FROM the manufacture of safes and bank-vault doors to the building of anti-aircraft gun carriages must seem a far cry to persons unfamiliar with operations in the metal-working industry. Engineers acquainted with that industry, however, know that a great deal of the machine tool and other equipment required in machining and fabricating bank-vault entrances and safes could also be applied to machining and fabricating parts for gun carriages to extremely close tolerances, and that the experience gained in years

Anti-Aircraft Gun Carriages ★

of safe-building would be invaluable in solving problems involved in adapting a shop to producing this important ordnance item of modern warfare.

The York Safe & Lock Co., York, Pa., was awarded the first major contract placed by the War Department with a private company since the World War, and commenced the manufacture of 3-inch anti-aircraft gun carriages in the fall of 1938. These gun carriages weigh 7 1/2 tons, and measure 22 feet from tip to tip of the outriggers when they are folded together, as seen in Fig. 3.

The important tactical feature of these gun carriages is that they can be easily towed from place to place at highway speeds of 40 miles an hour without damage to any of the mechanism, and then quickly set up in the desired locations. When emplaced with the outriggers extended as seen in Fig. 2, the outriggers have a spread of 52 feet. The gun carriages are equipped with a leveling mechanism so designed that the gun mount will remain level during the firing of the gun, even though the outriggers are not placed on level ground. This makes possible the firing accuracy so necessary in combating a speedy airplane bomber. A battery of four of these anti-aircraft guns, operated with one set of fire control equipment, will average one hundred aimed shots a minute.

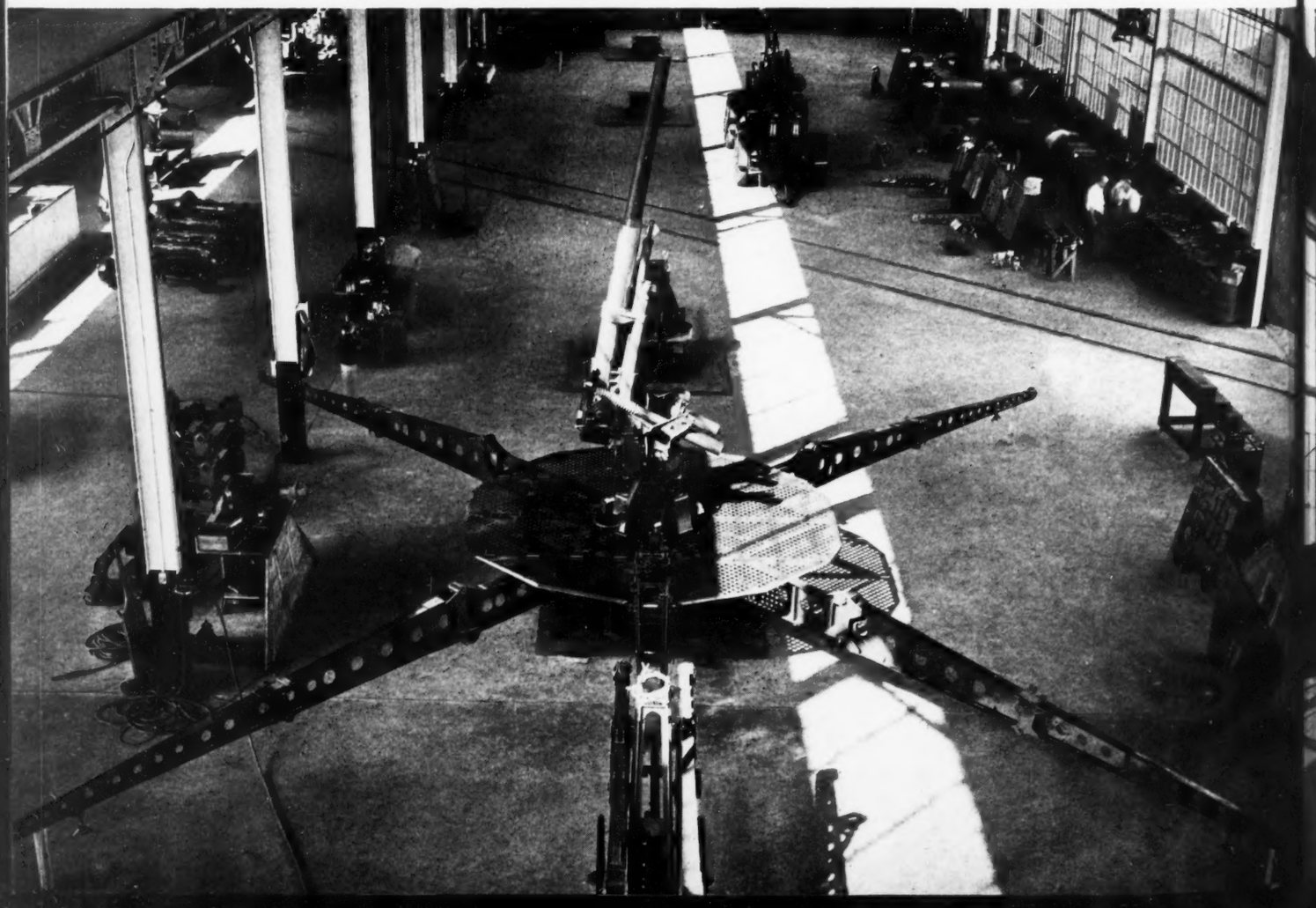
One of these anti-aircraft gun carriages consists of two rubber-tired bogies to which the four sets of folded outriggers are attached for transportation purposes. The folded outriggers form a chassis for the unit, as they connect the front and rear bogies. The inner ends of the outriggers are connected to the corners of a pedestal that supports the top carriage. The latter can be revolved on the pedestal through 360 degrees for sighting the gun on a target. The gun trunnions are mounted in bearings on the two arms of the top carriage.

When the carriage is ready to be set up for action, the two jacking screws built into the pedestal are run out to the ground and the weight taken off the bogies. The bogies are then disconnected from the outriggers and pulled out of the way, the outriggers are extended to their maximum lengths, and the jacking screws are screwed up to permit the outriggers and the pedestal to rest on the ground. Each outrigger consists of three sections. The bogies are equipped with rubber tires having bullet-proof tubes, and with electric power brakes. Ordinarily, the gun carriages are towed from place to place by army trucks which also carry the gun crew.

Practically all the major parts of the gun carriages, such as the pedestal, top carriage, outriggers, and fenders are of welded steel construction. This has effected a large saving in weight over the cast construction previously employed. For example, the cast outriggers weighed 4740 pounds, while the welded type weigh only 3008 pounds,

Fig. 1. (Above) Three Anti-aircraft Gun Carriages in the Erection Shop, after being Given a Road Test, Ready to be Turned Over to the War Department

Fig. 2. (Below) The Outriggers, which Measure 52 Feet Across, Provide a Steady Support for the Gun without Requiring the Emplacement to be Anchored



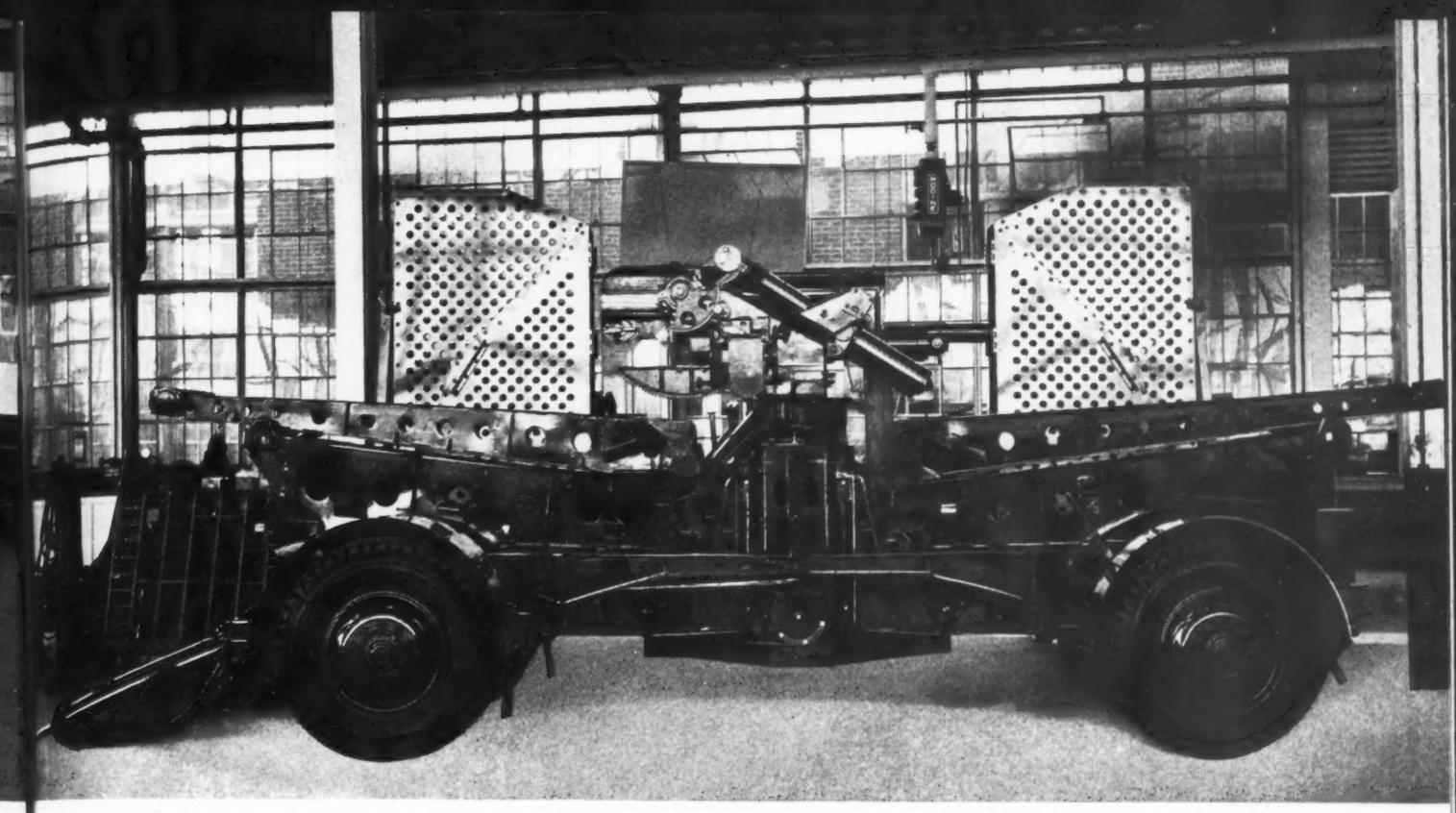


Fig. 3. (Above) The Anti-aircraft Gun Carriages. Folded together with Front and Rear Bogies Attached. Form a Compact Unit that can be Quickly Transported

Fig. 4. (Below) One of the Final Inspections Consists of Checking the Alignment of the Gun and the Backlash in the Traversing and Elevating Gearing

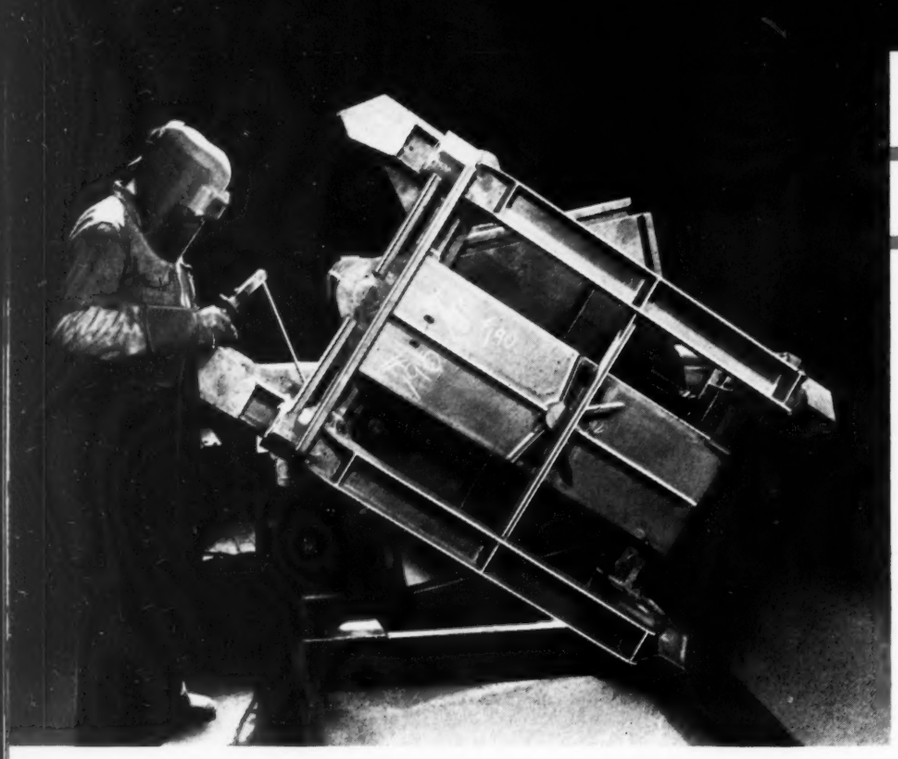


Fig. 5. Welding of the Various Parts of the Anti-Aircraft Gun Carriages is Facilitated by the Use of Positioning Machines

which represents a saving in weight of over 36 per cent. Likewise, whereas the front bogie of cast construction weighed 590 pounds, the welded bogie weighs only 430 pounds, and there is a comparable saving with the welded rear bogie. Savings in weight obtained by making the pedestal and top carriage of welded construction are 27 and 37.7 per cent, respectively. Steel plate 3/16, 1/4, and 3/8 inch thick is used in fabricating the various gun-carriage units. All together, there is over 3000 feet of welding on each gun carriage.

In Fig. 1 are shown three complete anti-aircraft gun carriages, ready to be turned over to the War Department. When the photograph was taken, these gun carriages had already been given a road test to determine their maneuverability, check the action of their electric brakes, ascertain the alignment of the bogies, etc. They had also been inspected in the manner seen in Fig. 4 to determine the accuracy of the gun alignment with respect to a target painted on the wall of the erecting shop.

Typical operations in welding, machining, and inspecting parts for these anti-aircraft gun carriages will now be described. The welding of a front bogie frame is seen nearing completion in Fig. 5. The pieces that make up the bogie frame were first tack-welded in place, and then the unit was bolted to the Ransome positioner, shown in the illustration, for complete welding. This positioner is provided with a table that can be revolved 360 degrees around its spindle, and the table unit is supported on a trunnion that can be turned through 180 degrees. This construction enables the welder to make all welds in a horizontal plane, or "down-hand" position. The positioner is operated by electric motors, with push-button control.

All "weldments," as the steel welded parts are termed, are stress-relieved in the Surface Combustion recirculating type of furnace shown in Fig. 6, which is designed to receive a flat car 18 feet long by 12 feet wide. This flat car, the front end of

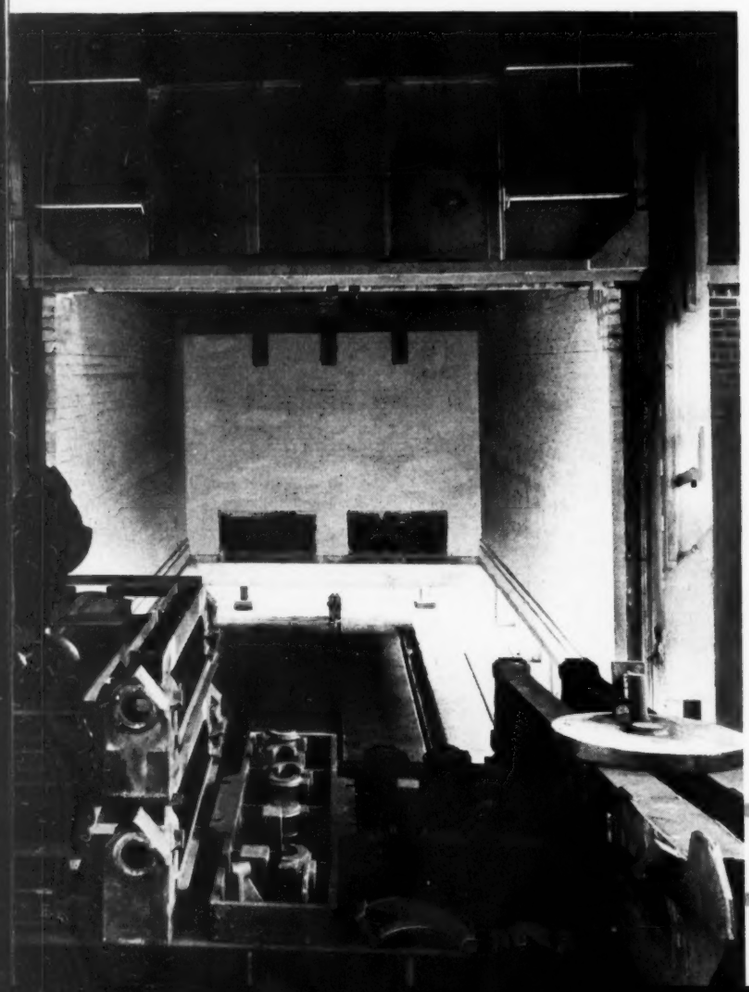


Fig. 6. All Weldments are Stress-relieved in This Recirculating Type of Gas-fired Furnace prior to being Machined

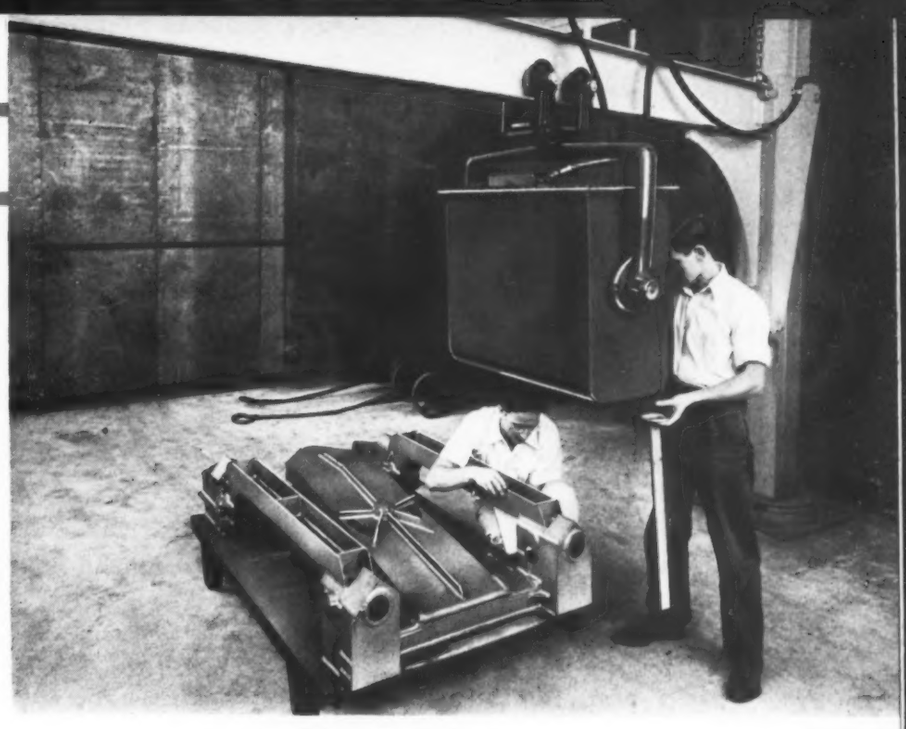


Fig. 7. X-ray Photographs are Taken of All Weldments to Insure that the Class A Welding Specifications are being Satisfied

which can be seen in the illustration, is completely loaded with outriggers, pedestals, or other weldments, and then pushed into the furnace. Angle-irons extending along the bottom of the furnace on all sides are pushed through sand lying in troughs that extend along the ends and sides of the car. This insures complete sealing of the heated atmosphere within the furnace walls.

In the stress-relieving operation, the work is "soaked" in the furnace for six hours at a temperature of 600 degrees C. (1112 degrees F.), and then allowed to cool in the furnace. The complete cycle requires about twenty-four hours.

All weldments are inspected by means of General Electric 200-K.V. shock-proof X-ray equipment to determine whether the required welding standards have been attained. The number of X-ray photographs taken varies with the type of the part. The X-ray photographs are taken at random on some parts, and at highly stressed locations on others. Fig. 7 shows the operators of the X-ray laboratory aligning a bogie frame for taking an X-ray exposure. In addition to being inspected by X-ray, every weldment is inspected visually. They are also inspected by the Magnaflux method. All important castings, as well, are subjected to Magnaflux inspection.

One of the newly installed machine tools is the large Sellers floor type, horizontal boring, drilling, and milling machine shown in Fig. 8, which has a 5-inch spindle and is equipped with a floor plate. The column travels 10 feet crosswise and the toolhead 8 feet vertically on the column. The close-up view of this machine in Fig. 9 shows a solid face milling cutter finishing pads on one end of an intermediate outrigger section. The work is reversed end for end on the machine table for finish-milling internal and external flat surfaces on the projecting ears seen on the right-hand end of the outrigger section in Fig. 8. An inserted-blade milling cutter is used for taking these cuts.

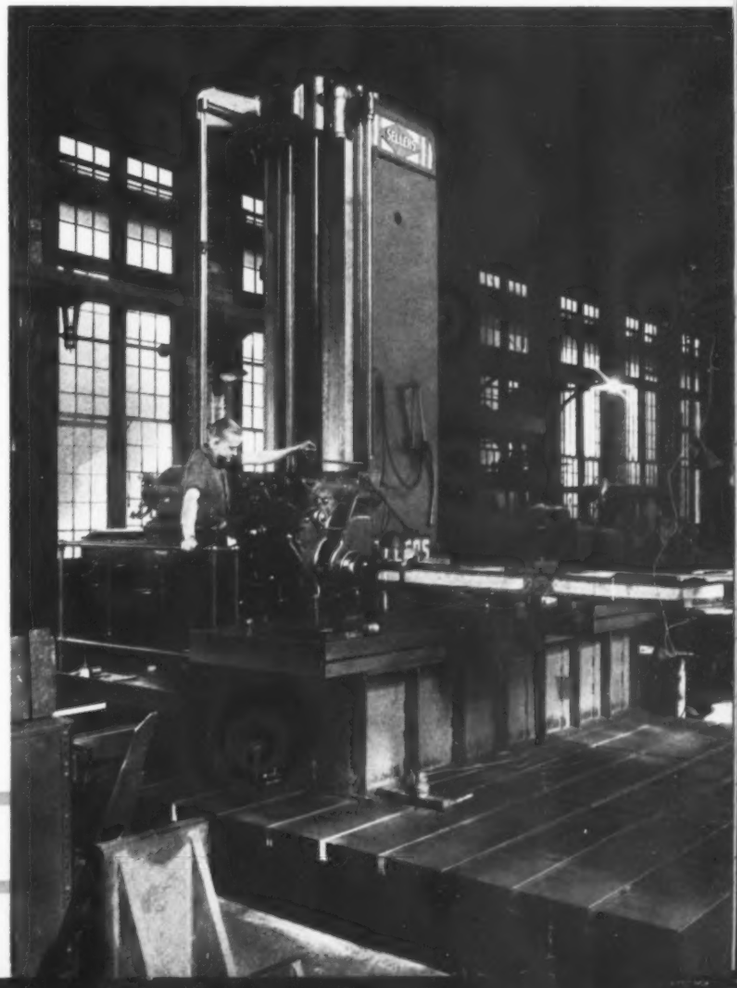


Fig. 8. Large Horizontal Boring Mill Employed for Machining a Variety of Parts for Anti-aircraft Gun Carriages

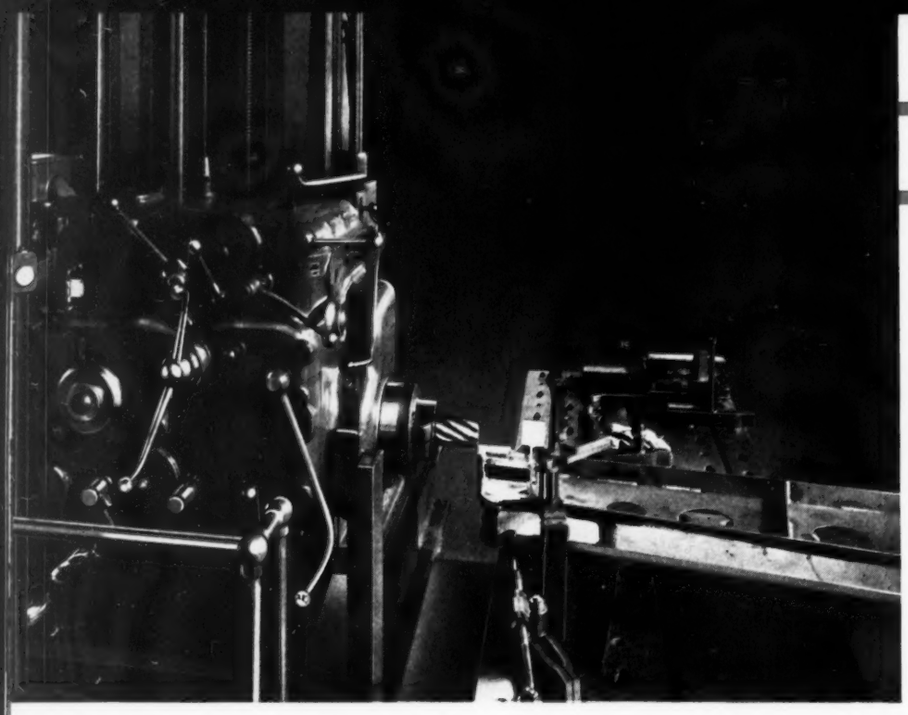


Fig. 9. Close-up View of Operation Shown in Fig. 8, which Consists of Machining Ends of Outrigger Sections

Another horizontal boring, drilling, and milling machine, of the table type, is shown in Fig. 10 milling pads on a top carriage weldment. The weldment is mounted in a fixture that has two locating sides, so that it can be set up as shown, and also placed upright with the work on top. Four cuts are taken on the work while the fixture is in each position. In taking these cuts, long dimensions between surfaces on opposite sides of the work must be finished within close tolerances.

One of the operations on the top carriage weldment consists of boring it from both ends in a lathe, as illustrated in Fig. 11. The work is supported on two tables of different heights on the carriage, which are provided with suitable rests and clamp blocks. The boring-bar extends from the headstock to the tailstock, and cuts are taken by feeding the work along the boring-bar. Two rough-boring cuts and one finish-boring cut are taken on the bore at the right-hand end of the work, as seen in the illustration, which is machined to close tolerances.

Both ends of the weldment are also faced in this operation by means of spot-facing tools. The tool for the far end of the work is mounted directly on the boring-bar, which is also true of the boring and reaming cutters, while the facing tool for the near end of the work is mounted on the holder that also carries the boring cutters for this end.

The next operation on the top carriage weldment consists of turning, boring, threading, and facing on the Cincinnati 10-foot vertical boring machine seen in Fig. 12. In this operation, straight surfaces are turned on the spindle, as shown, and the welded steel skirt at the bottom end is bored, faced, and recessed around on a flat surface. The large-diameter rim is bored to fit around the socket casting lapped in the operation shown in Fig. 14, while the recess is cut to receive a large ball bearing. The acute-angle cutter seen on the ram of the boring mill is used in taking the recessing cut. The top carriage as seen in Fig. 12 is upside

Fig. 10. Another Horizontal Boring, Drilling and Milling Machine, of the Table Type, Milling Various Surfaces on a Top Carriage Weldment

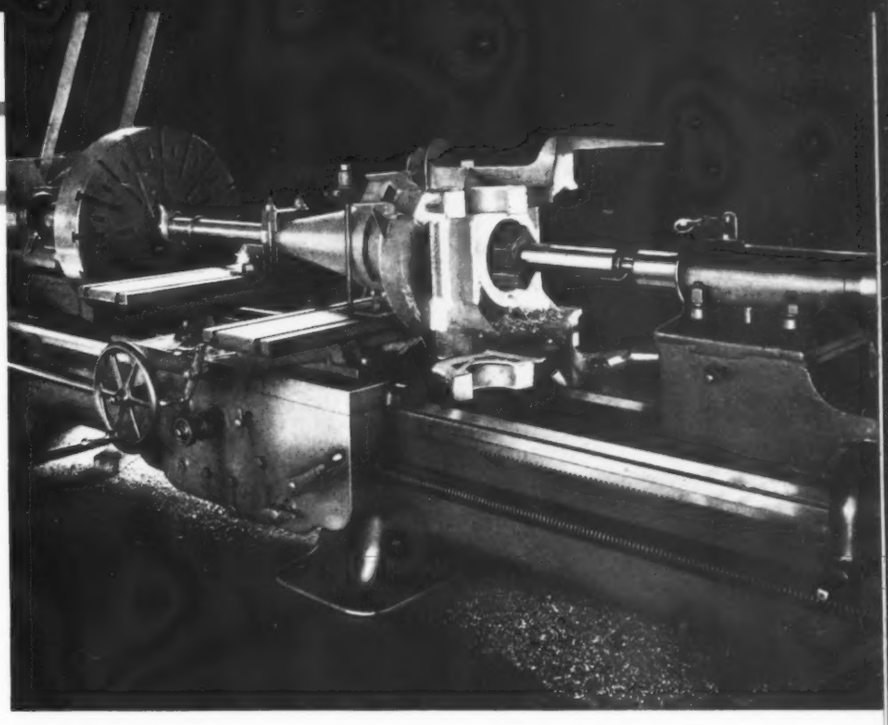


Fig. 11. Special Set-up Used on a Standard Lathe for Center-boring a Top Carriage Weldment

down, that is, in the reverse position from that in which it is assembled on the pedestal of the gun carriage.

Boring and facing cuts are taken on the welded steel pedestals by other vertical boring mills, such an operation being seen in progress in Fig. 13. When cuts at one end of the pedestal have been completed, the work is turned upside down for machining the opposite end.

The application of a Bullard vertical turret lathe for turning the spherical external surface on a large manganese-bronze bearing for the leveling mechanism of anti-aircraft guns is seen in Fig. 15. Boring and facing cuts are taken on this work in the same machine. The spherical surface is turned to a radius of close tolerance through the application of special and intricate tooling. Two cutters are used on the side-head for turning, and six cutters on the turret for boring the upper end of the part and for facing both sides of the flange and the top of the part. The position of the work is, of course, reversed for facing the bottom side of the flange. The previously bored lower end of the work is seated on a circular locating plate on the fixture for the set-up illustrated.

This manganese-bronze bearing mates with a cast-steel socket of the type seen on the floor in Fig. 14, which is spherically bored on its internal surface, straight turned, faced, and bored, on a Bullard vertical turret lathe. Each mating spherical bearing and socket are finally lapped together in the machine illustrated in Fig. 14. In this operation, the bronze spherical bearing is constantly tilted up and down in the socket as the machine revolves, carrying the socket around the non-rotating spherical bearing.

The tilting action is produced by a cam arrangement as follows: A ball-bearing roller is attached to an overhead arm, which, in turn, is fastened to the spherical bearing. The roller runs up and down on top of a circular cam that surrounds the work

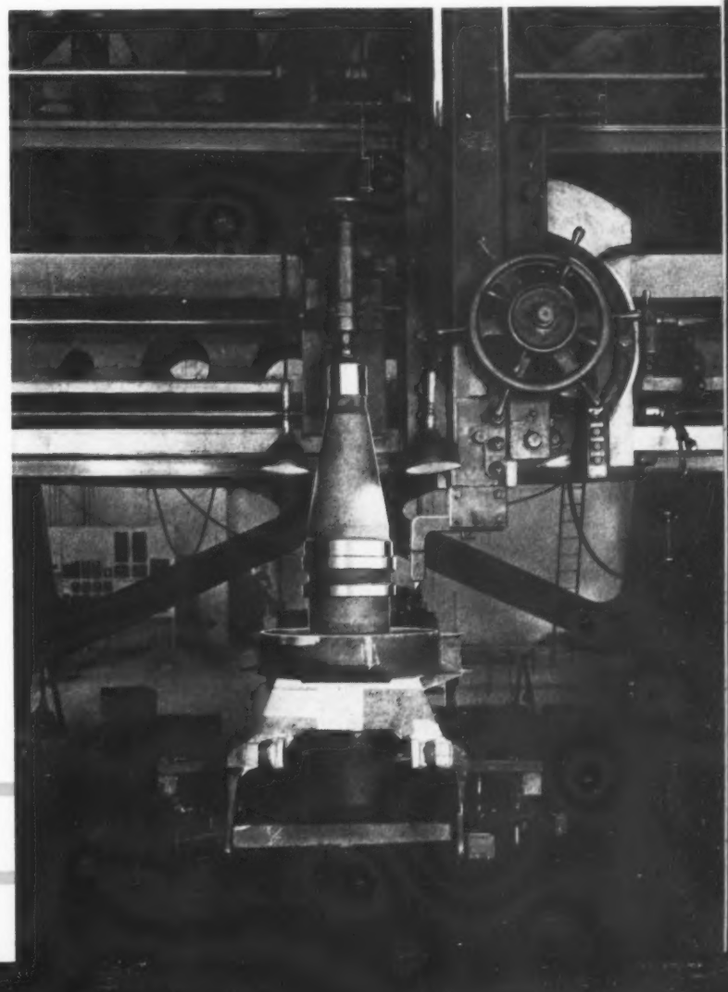


Fig. 12. Complicated Top Carriage Weldment Jigged up on 10-foot Boring Mill for Various Turning, Boring, Threading, and Facing Operations

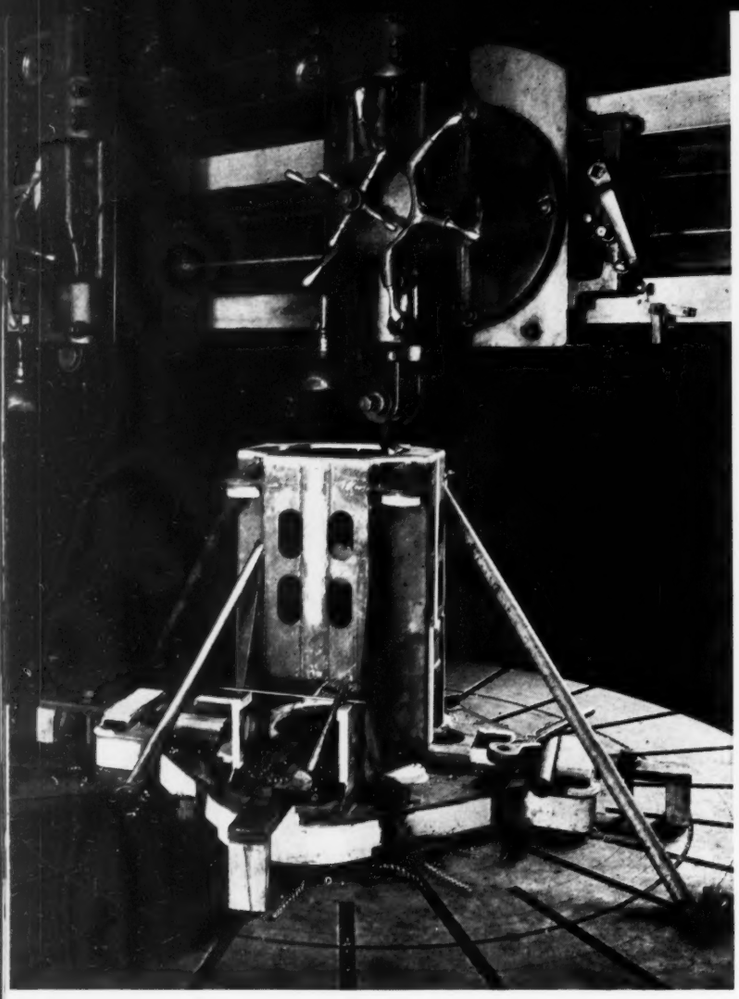


Fig. 13. (Top Left) Another Vertical Boring Mill Employed for Machining the Pedestal Weldments

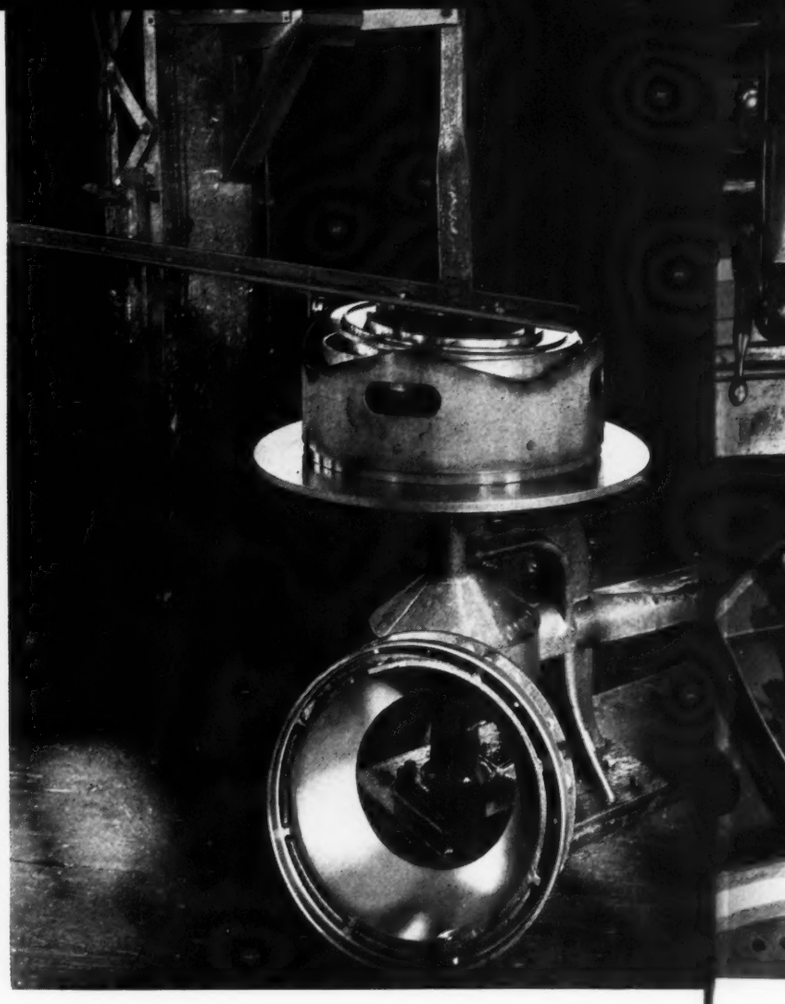


Fig. 14. (Top Right) Large Bronze Spherical Bearings are Lapped to Their Steel Sockets in a Lapping Machine of Special Construction

and revolves with the table. The outer end of the arm that carries the roller is weighted to hold the roller on the cam path, and the arm is prevented from revolving with the machine by overhead links fastened to a bracket which is mounted on an adjacent column, and also by the arm coming in contact with the column. The practice is to lap the two parts until they are perfectly fitted together. A fine lapping and grinding compound is used during the operation.

Radial drilling machines are employed for a large number of operations on parts for the anti-

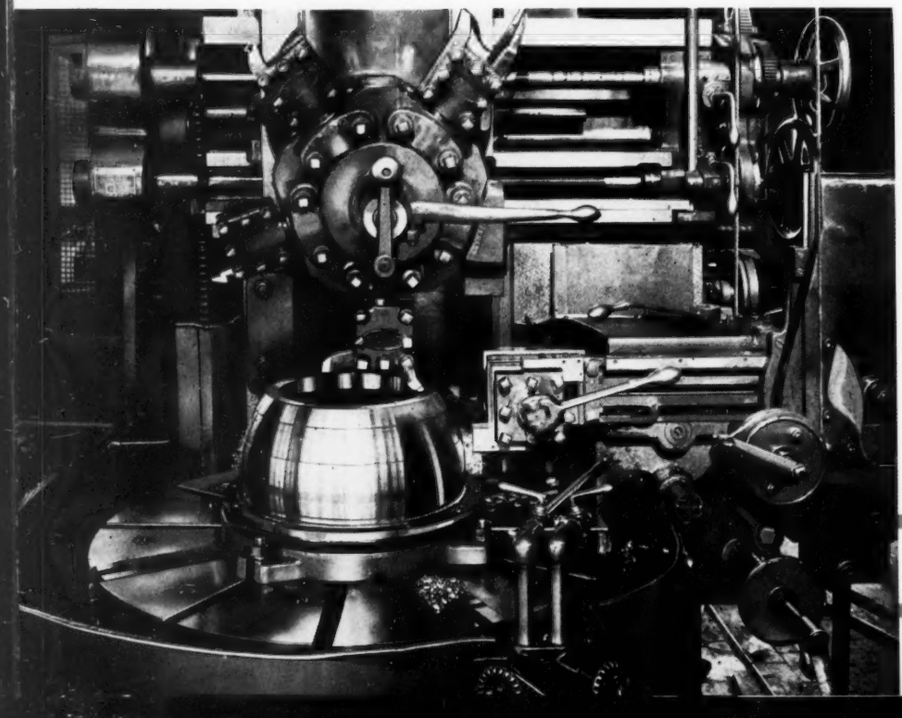
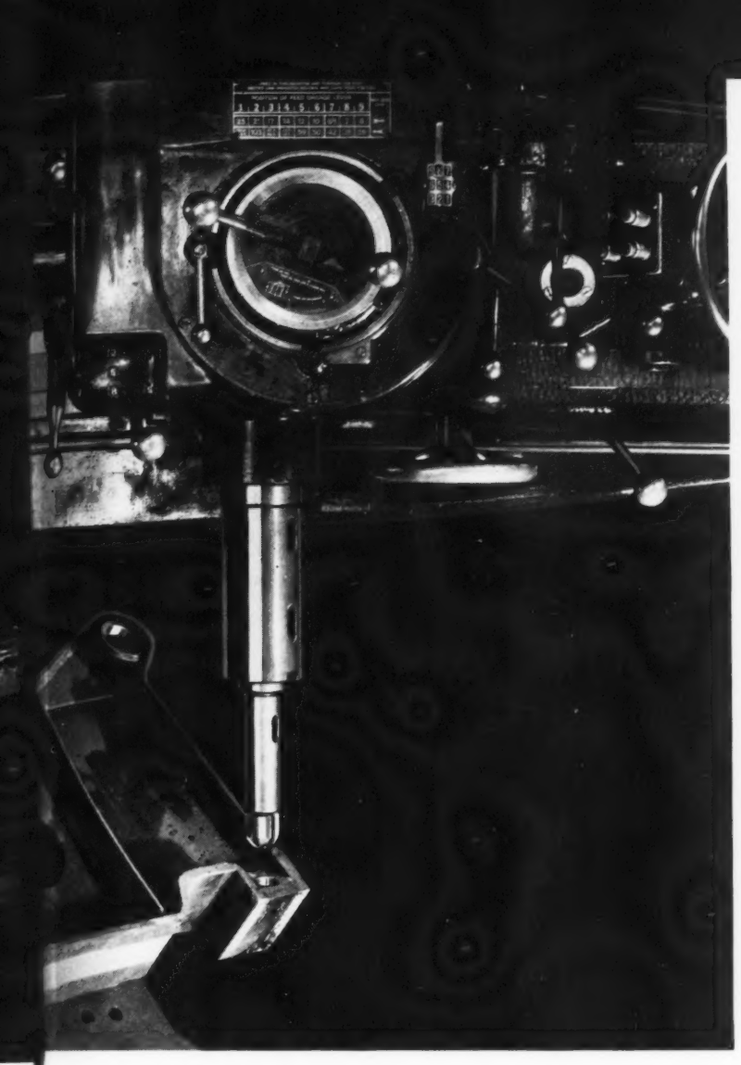


Fig. 15. The Spherical Surface of Bronze Bearings is Machined on a Vertical Turret Lathe Equipped with Special Tools and Fixtures



aircraft gun carriages. One of the most interesting jobs performed on machines of this type consists of drilling a large number of lightening holes through the aluminum platform plates which may be seen in the vertical position on the mount in Fig. 3. In Fig. 18, a Cincinnati Bickford radial drilling machine is shown being used for drilling, boring, and reaming many holes in a main outrigger section, the work being clamped in a jig to insure very accurate location of these holes. Through the use of the boring-bar shown, the two holes for the pedestal pin are line-bored simultane-

Fig. 16. (Top Left) Machining a Spherical Seat at Outer End of Main Outrigger to Receive Bogie Hold-down Screw

Fig. 17. (Top Right) Checking the Pitch Diameter of the Thread in a Large Nut by Means of an Adjustable "Go" and "No Go" Gage

Fig. 18. Main Outrigger Weldments, Set up in Jig, are Accurately Drilled, Bored, and Reamed on This Heavy Radial Drilling Machine

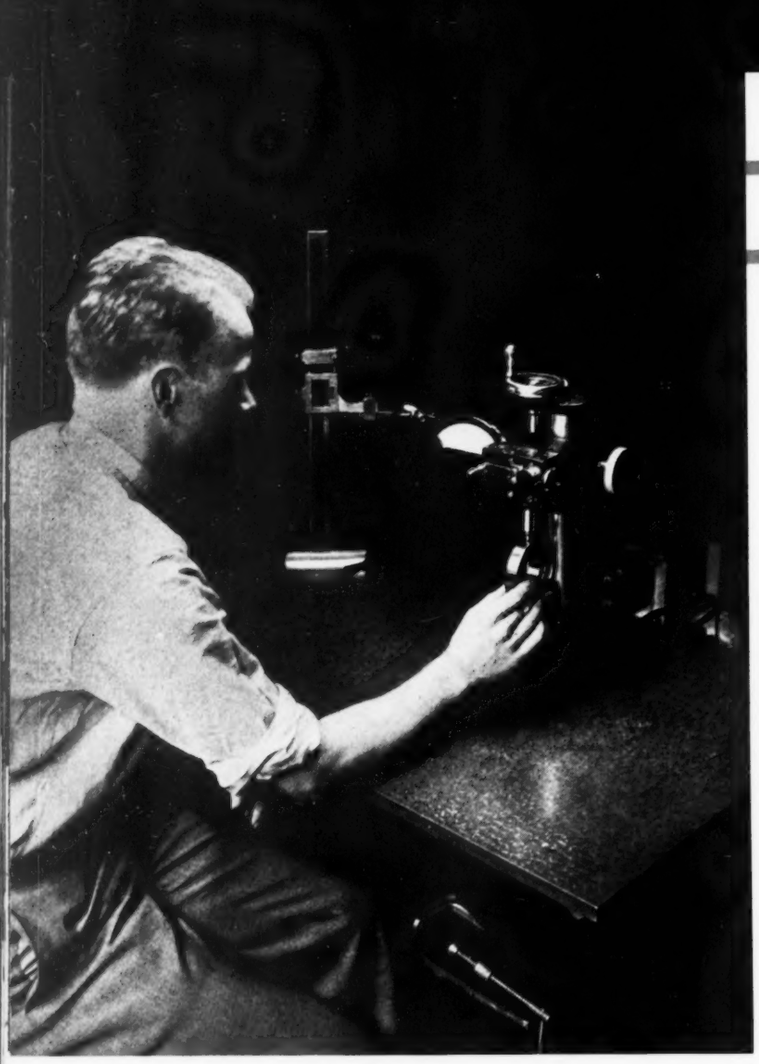


Fig. 19. An Electrolimit Gage in the Inspection Department Insures that All Ball Bearings Used in the Anti-aircraft Gun Carriages will be within a Tolerance of 0.0005 Inch

ously. The boring-bar is fitted with cutters spaced far enough apart to suit the distance between the two bores. The boring-bar is guided in bushings at both the top and bottom of the jig.

In Fig. 16 is shown a close-up view of another Cincinnati Bickford radial drilling machine machining spherical seats in main outriggers to receive the ball end of bogie screws. The round-nose milling cutter cuts the spherical seat after a hole has been drilled in the same set-up. Two bogie screw seats are machined in each main outrigger.

The care with which the parts for anti-aircraft gun carriages are inspected is typified by the operation shown in Fig. 17. This consists of checking the internal threads on a large brass nut for accuracy of pitch diameter. Use is made of a Pratt & Whitney gage equipped with threaded plugs mounted vertically at the opposite ends of arms which slide endwise in relation to each other, so that the distance between the threaded plugs can be quickly adjusted. On the adjacent faces of the sliding arms are small plain plugs between which a stepped gaging block may be inserted, as illustrated. One of the steps on this flat block is used for taking a "Go" reading, and the other for taking a "No Go" reading.

In Fig. 19 is shown a Pratt & Whitney Electrolimit gage which is employed for a number of close inspections, including the checking of ball and roller bearings for diameter of the outer race. This dimension must be within 0.0005 inch of the specified size.

Various sub-assemblies and detail pieces of the anti-aircraft gun carriages, after being burred and carefully inspected, are routed to paint spray booths as shown in Fig. 20. In the paint booth, a priming coat is first sprayed on the work, then finish coats of color enamel are applied. Sufficient time is, of course, allowed between spraying operations to insure complete drying of the coat.

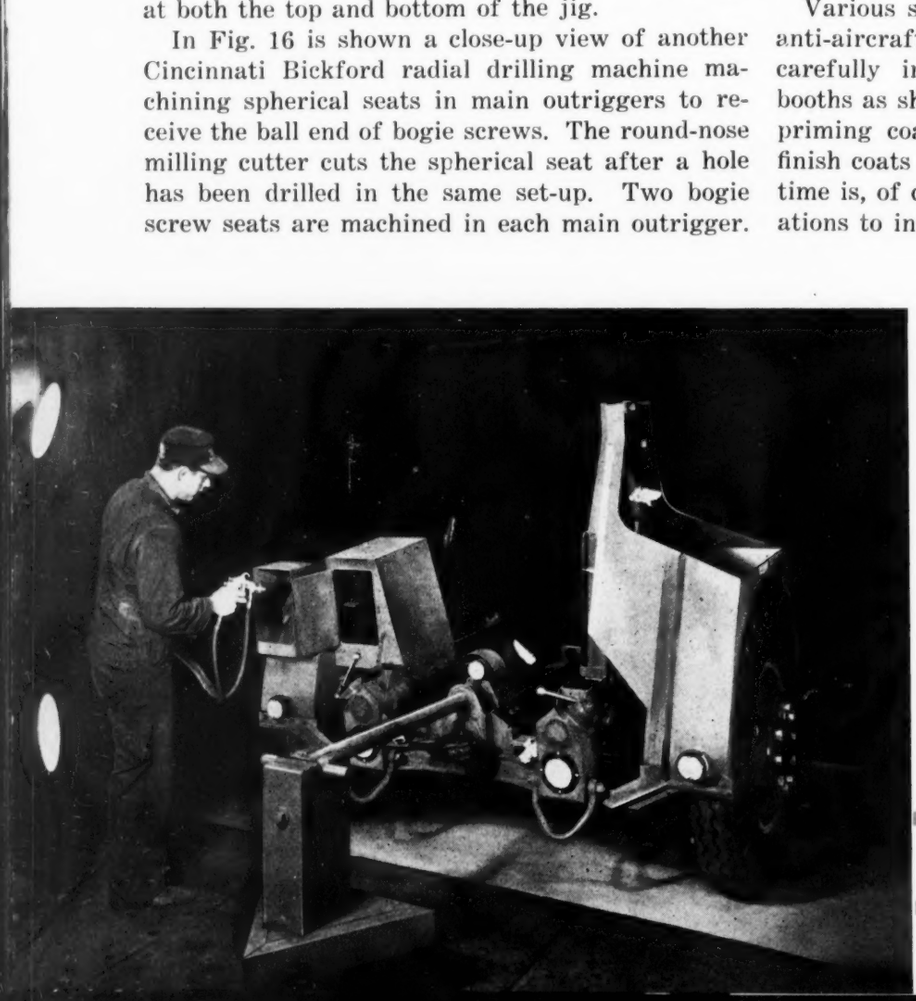


Fig. 20. All Assemblies and Detailed Parts of the Anti-aircraft Gun Carriages are Given Three Coats of Paint in This Spray Booth before They are Routed to the Final Assembly Department

Engineering News Flashes

A Voltmeter that Detects 37,000 Volts on a Powder Plant Motor Belt

Static electricity in a powder plant can be a very troublesome hazard. Recently conducted experiments with a General Electric electrostatic voltmeter applied to the V-belt of a 25-H.P. motor indicated the presence of approximately 37,000 volts on the belt. These preliminary tests led to more extensive research. As a result, a belt dressing of a conducting nature was found that would permit a continuous discharge of accumulated static electricity. Conveyor belts and rubber-tired trucks were similarly investigated. Tests indicated that voltages of high value were generated simply by walking across the carpet of an office. Many changes were made to minimize the hazards of explosion from static electricity.

Improved Black Finish on Steel by "Jetal" Process

An improvement has recently been developed in the "Jetal" process for applying a black corrosion- and rust-resistant finish to steel. This process, developed by the Hanson-Van Winkle-Munning Co., Matawan, N. J., now has been changed to a two-bath system, which produces a deeper black coating, and at the same time, permits of simpler manipulation and control of the solution.

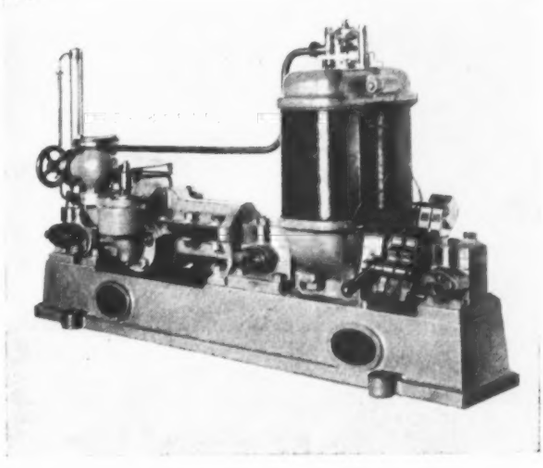
Two tanks of ordinary iron or steel are required for "Jetalizing." No brass or copper fittings should be used. The first tank is kept at a temperature of from 280 to 390 degrees F., and the second at from 305 to 315 degrees F. Three water-rinsing operations are involved, which may be carried out in one or more steel tanks. The water containing the "drag-out" should be used to replace evaporation losses from both of the "Jetal" tanks, but the iron in the drag-out water should be removed before it is returned to the system, either by filtration or by allowing the iron to settle and siphoning off the clear water.

Long Life of Stellite Rolls for Straightening Spring Wire

Some ten years ago, the National Telephone Supply Co., Cleveland, Ohio, used steel rolls—some plain, some grooved—in their ten machines for straightening tempered high-carbon steel wire. One man was kept busy making and servicing the rolls, because the abrasion was so great that a complete set wore out in four months. Then a set of Stellite rolls was installed on one machine. After three months of use, so little wear was evidenced on this set that all ten machines were equipped with similar rolls. These rolls were not replaced until they had been in service almost ten years. They lasted over twenty-five times as long as the average steel roll, and operated satisfactorily during the whole period.

Giant Conveyor Belt Moves 1000 Tons of Coal an Hour

A giant conveyor belt has been produced by the United States Rubber Co., 1230 Sixth Ave., New York City. This is said to be the largest single-unit slope conveyor belt in the world. It is now in operation at the Fifth Vein Coal Co., Harrisburg, Ill. This belt is what is known as a nine-ply Matchless belt, 1530 feet long and 54 inches wide, weighing 35,000 pounds. It conveys 1000 tons of run-of-mine coal an hour at a speed of 350 feet per minute, raising the coal over 200 feet from the coal seams to the preparation plant.



This early Parsons reaction type turbine-generator, built in 1885, has been acquired by the Smithsonian Institution from the Allis-Chalmers Mfg. Co., Milwaukee, Wis. Sir Charles A. Parsons, the originator of the reaction type steam turbine, presented it to the Allis-Chalmers Mfg. Co. in 1912, where it has been treasured as a valuable engineering relic ever since. The turbine has a rating of 10 effective horsepower. The total length is 5 feet, and extreme width of the direct-current generator, 14 1/2 inches.

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Mechanism for Tripping a Rotating Lever

The mechanism shown diagrammatically in the accompanying illustrations is designed to operate a trip-lever within a revolving housing at certain predetermined intervals, the exact time of each operation being controlled by a cam driven at the correct speed. The revolving housing *A*, Fig. 1, is mounted on sleeve *B* held on shaft *C*. The housing or head *A*, with its group of parts, revolves on sleeve *B* in the direction indicated by arrow *D*. The short lever *E* is free to pivot, and is pinned to shaft *F*, shown in cross-section. Lever *E* carries a roll *G* which comes in contact with a long radial dwell *I* on lever *H*, the latter lever being attached to the housing by fulcrum stud *J*.

The long lever *H*, with a roll *K* at the end, is held in the outward position, away from the center of the revolving housing by means of spring pin *L*, the outward movement being limited by a stop-pin at *M*. When roller *K* moves in and out a distance *a*, Fig. 2, pivoting about stud *J* as a center, the short lever *E* rocks shaft *F*. This rocking action, in turn, operates a trip mechanism (not shown) which is located within the machine itself. A spring within the machine serves to hold the short lever in its outer radial position.

The mechanism for operating the long lever *H* at predetermined intervals as it revolves past a non-revolving cam surface *V* on lever *P* is actuated by cam *W*. Referring to Figs. 1 and 2, bracket *N* is attached to the side of the machine and carries lever *P*, which is pivoted at *Q*. Spring *R* serves to hold lever *P* back against the beveled or cam surface *S* of a sliding member *T*. Member *T* is free to travel up or down in a guide-way of the bracket. Cam surface *S* of the slide operates to push lever *P* to the right, so that roll *K* on the revolving lever *H* strikes the cam surface *V* at the correct time for operating the trip mechanism.

Actual timing of the trip is accomplished by cam *W* on a shaft which revolves in time or synchronism with the other operative units of the machine. Lever *X*, with a roller at *x*, pivots on a stud at *Y*.

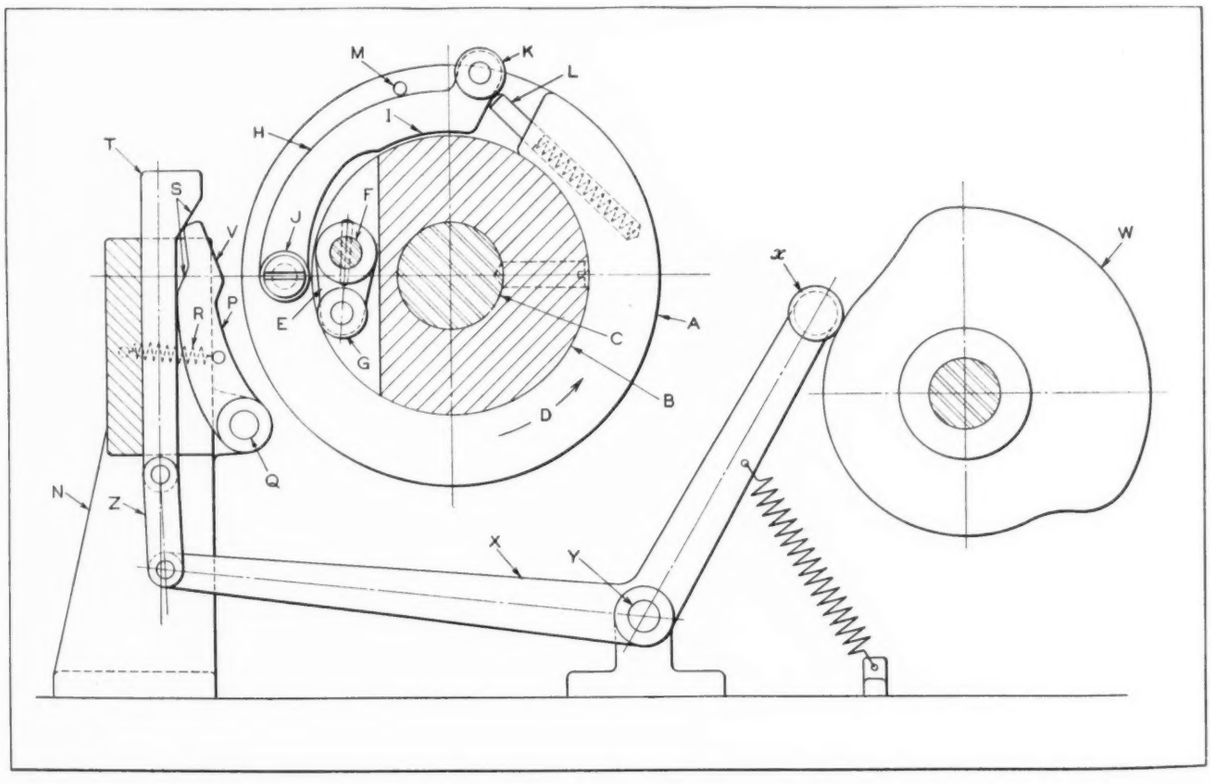


Fig. 1. Mechanism for Operating a Trip-lever on Shaft F within the Revolving Head A

Lever *X* actuates slide *T* through connecting link *Z;* thus, when cam *W* and head *A* revolve in proper synchronism, the surface *S* on slide *T* is moved into engagement with lever *P* which, in turn, places surface *V* in position to push lever *H* over, as shown in Fig. 3, causing the short lever *E* to operate the tripping mechanism within the machine.

F. H. M.

* * *

Exports of Industrial Machinery at High Levels

The exports of industrial machinery from the United States reached a value of $38,466,000 in August, the last month for which complete figures are available. This was a considerable increase over July, when the exports were valued at $31,094,000, due largely to an increase of nearly 60 per cent in the shipments of machine tools to England, according to the Machinery Division of the Department of Commerce.

August shipments of power-driven metal-working machinery reached the record total of $21,420,000, surpassing the previous high of $21,281,000 established last April, and showing a 44 per cent increase over July. Of the total, grinding machines accounted for about $4,500,000; engine and turret lathes, $3,800,000; milling machines, $2,865,000; and drilling machines, $918,000. The shipments of metal-working machinery and equipment other than power-driven were valued at about $940,000.

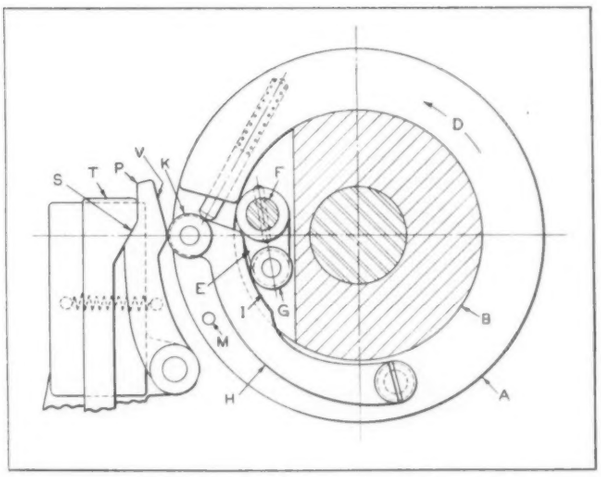


Fig. 3. Lever H, Forced Inward by Cam Surface V on Lever P, Causes Cam I to Rotate Shaft F in Counterclockwise Direction through Contact with Roller G

Proposed Standard for Leather Belting

Drafts of a proposed standard for flat leather belting are being distributed to those interested in belting, either as manufacturers or users, by the Sectional Committee on Standardization of Leather Belting of the American Society of Mechanical Engineers, 29 W. 39th St., New York City. Any engineer or company interested in leather belting is invited to ask for a copy of the proposed standard for criticism and comment.

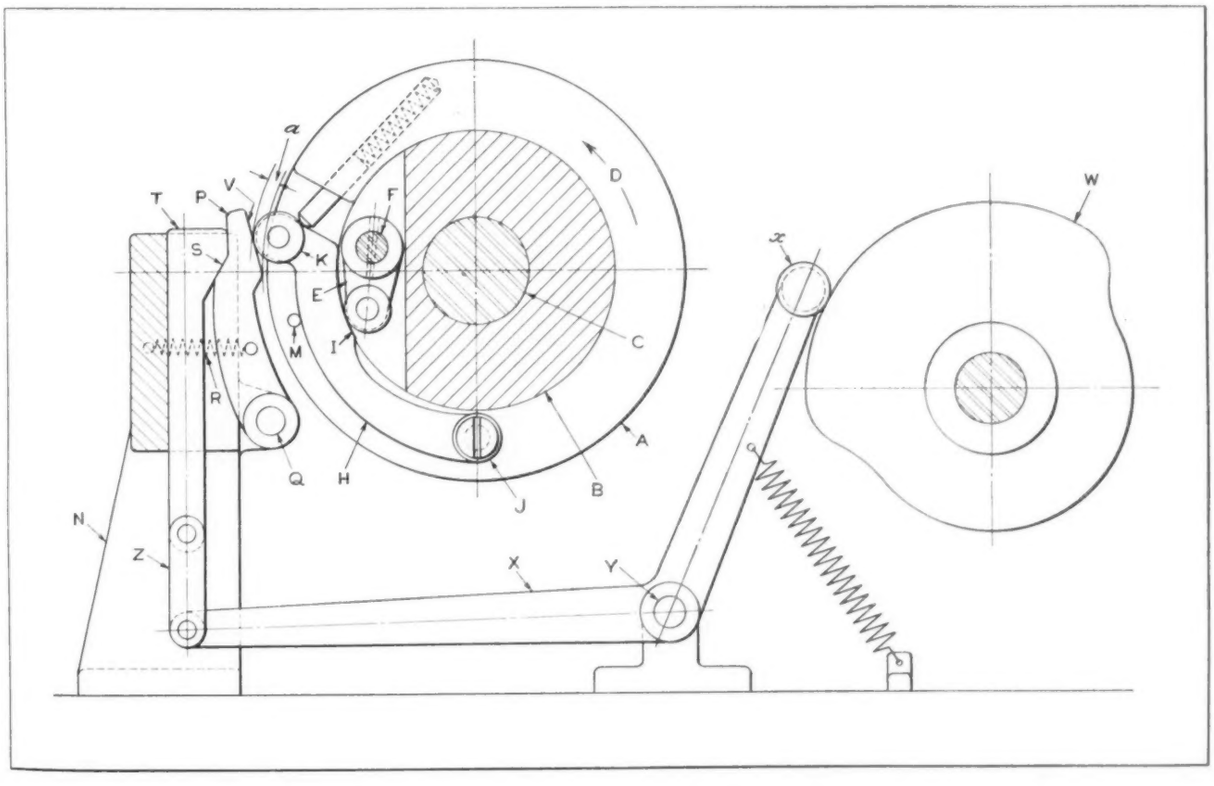


Fig. 2. Mechanism Shown in Fig. 1 with Lever P brought into the Operating Position by Cam W

EDITORIAL COMMENT

The Tool Engineer's Important Part in the Defense Program

Frequently a manufacturing organization is thought of as consisting chiefly of two main divisions—the manufacturing department which produces the product, and the sales department which disposes of it. Every important organization, however, also has an engineering department that designs the product, and tool engineers who devise the means by which the product can be economically built.

At no time is the tool engineer of greater importance than when the pressure of production is as marked as it now is in the industries engaged in making materials for defense. Capable tool engineering not only speeds up production greatly, but also reduces costs. The tool engineer, therefore, holds a key position in the National Defense Program; that he is doing his work well is evidenced in many cases where production of ordnance and naval material has been greatly speeded up by the adoption of new methods suggested by him. Successful results are achieved by each link in the chain doing its part; among these links, tool engineering should be accorded due credit.

If there are Idle Machines Available, Use Them

In a booklet entitled "Think Fast America," the Trundle Engineering Co. points out that it may not be necessary to wait until we have turned out enormous quantities of new machinery and tools to start producing in a big way for our defense program. "Of course," says the booklet, "we will need vast quantities of new machinery and tools, but that does not mean that we cannot start now." In every city, there are plants in which a great deal of machine tool equipment is standing idle. Throughout the United States there probably exist enough productive facilities to enable us to swing into the preparedness program on a large scale almost immediately, if these productive facilities are coordinated in one place and put to work.

How can this be done? By taking inventory of various types of equipment in all the plants in the country, especially listing such machines as are idle and available. Of course, a good share of this equipment may be old; but all of our defense supplies do not require the latest types of machines for their manufacture. Many idle machines, even though not modern, can be used temporarily for single-purpose production; others could be easily rebuilt to meet immediate needs.

It Takes Judgment to Know when to Slight Work

Since accuracy is the watchword of the machinery industries, it may seem odd to suggest that much time and effort and, consequently, expense, are frequently wasted by working to too close limits where great accuracy is not required for the proper functioning of a machine or device. Years ago, a skilled and ingenious mechanic said: "It takes an exceptionally good man to know when to slight work." There is a deep meaning in these words.

During the last war, for example, the preparations for the effective conduct of the war after the entry of the United States, were hampered to a considerable extent because, in many instances, too close tolerances were specified for war material. This was doubtless due to the mechanical inexperience of many of the men who prepared the drawings and specifications. Rather than to take chances on the work not being good enough, they specified an accuracy that for many purposes was wholly unnecessary. Inexperienced inspectors at that time also expected manufacturers to follow literally all dimensional requirements, because they did not have sufficient training to be able to use their own judgment safely. Again, it takes an exceptionally good inspector to know when to slight work.

Where accuracy is necessary, there is no excuse for carelessness; nothing but the best is acceptable. But there is no sense in working to thousandths of an inch on parts that merely "fit in the air." Good judgment and adequate experience should determine in each case just what degree of accuracy is required. That having been done, the best engineering practice insists upon that degree of accuracy—no more, no less. In that way, unnecessarily high costs can be avoided and time can be saved, while the purpose to be served is achieved.

Defense Program the Keynote of Machine Tool Builders' Meeting

THE National Machine Tool Builders Association held a two-day meeting at the Edgewater Beach Hotel, Chicago, Ill., October 24 and 25, at which the chief topics discussed related to the problems resulting from the tremendous demands that the plans for armament manufacture place upon the machine tool industry. Compared with a year ago, the industry has doubled its output, which is now at an annual rate of $400,000,000, as against $200,000,000 a year ago. In 1941, the output will doubtless rise to at least $450,000,000, with a demand probably equal to a considerable percentage in excess of even that large figure.

The meeting was opened with an address by Clayton R. Burt, president of the Niles-Bement-Pond Co., on the subject "Industry Problems," in which the present situation in the machine tool industry was covered comprehensively.

In an address entitled the "Machine Tool Builder and the Defense Needs of the United States," Mason Britton, vice-chairman of the McGraw-Hill Publishing Co., who is serving as director of the Machine Tool Section of the Advisory Industrial Defense Commission at Washington, outlined the results obtained by the Army and Navy Munitions Board with the voluntary preference system now being used in connection with the manufacture and delivery of machine tools.

One of the unusual features of the meeting was a "Defense Quiz"—a panel discussion with questions from the floor on subjects relating to the defense program and legislation and rulings in connection with it. This part of the program was presided over by Clayton R. Burt, who is chairman of the Association's Defense Committee. The members of the panel were Howard W. Dunbar, vice-president and general manager of the Grinding Machine Division of the Norton Co.; Robert M. Gaylord, president of the Ingersoll Milling Machine Co.; Frederick V. Geier, president of the Cincinnati Milling Machine Co.; and Charles J. Stilwell, president of the Warner & Swasey Co.

On the second day of the meeting, John E. Lovely, president of the Association and vice-president of the Jones & Lamson Machine Co., made an address entitled "Essential Elements of the National Defense Program," which covered comprehensively the machine tool builder's part in this program and referred to the problems that the industry faces—which it is successfully solving—as a result of the accelerated demand for the industry's products.

The meeting was unusually well attended, notwithstanding the fact that the present great activity in the machine tool industry is placing urgent demands on the time of the executives who attended the meeting.

General View of the Heat-treating Department of the Boeing Aircraft Co., Seattle, Wash., showing a Hevi Duty Atmosphere-controlled Gas-fired Furnace with its Mixing Generator at the Right. A Landing Gear Tube is About to be Quenched after having been Raised to the Required Hardening Temperature in the Furnace, the Tube having been Previously Machined all over except for Finish-grinding. The Oil Quench is Agitated by Compressed Air to Insure Adequate Flow of Oil across the Surfaces of the Parts being Quenched

Welded Versus Cast Press Frames

By A. CLEMENTS, Staff Engineer
Verson Allsteel Press Co., Chicago, Ill.

BEING connected with the concern that originated fabricated steel-plate frame construction in the manufacture of punch presses, the writer has closely followed the articles that have appeared in MACHINERY during the past year relative to welded versus cast-iron frame construction in press building. In these articles, five points have been emphasized, which may be summarized as follows: (1) Higher cost of fabricated steel-frame presses; (2) greater compressive strength of cast iron; (3) superior vibration damping properties of cast iron; (4) harder wearing surfaces of cast iron; and (5) possible weld failure.

In certain cases, the cost of a press having a fabricated steel frame is greater than that of a cast-iron one of the same capacity. However, this applies principally to small open-back, inclinable presses and light tonnage, straight-sided presses. In medium-sized presses—up to 200 tons capacity—the difference is less marked, while welded presses having capacities greater than this are comparable in cost to cast-iron units, and in some cases, are even less costly.

With the advent of welded steel construction, many designers of presses rejoiced in the freedom in design which was theirs. Entirely new designs could be made without the added expense of new patterns for castings. Box-like structures could be designed so as to enclose more of the working parts of the press without materially increasing the weight. Neater and cleaner looking press designs were the result.

However, some of these designers immediately took full advantage of the greater structural strength of steel and substantially reduced the weight of the finished press. The result was a structure that was susceptible to vibration and did not possess the rigidity essential to perfect press performance.

By providing heavier plate sections than were actually required for the tonnage capacity of the press, it was possible to accomplish two very important things. A much stiffer frame was obtained, which had very low compressive and tensile stresses, with a factor of safety, in some cases, of 40 to 1 against frame breakage and 20 to 1 against permanent deformation. The vibration present in presses making 300 or more strokes per minute was also greatly reduced.

Press design, in the writer's opinion, should be considered from the standpoint of maximum stiffness, to obtain greater die life and low stresses, combined with a high margin of safety below the elastic limit at which the metal will take a permanent set. In designing a press—whether it be for heavy duty, normal duty, or high speed—the designer should proportion his press members first for stiffness and next for strength.

If rigid deflection standards are followed, the resultant stresses must be very low; that is, if a press is designed for maximum stiffness at full load, the tensile and compressive stresses in the press members will be lower than required from the standpoint of strength. The criterion of press design is, therefore, stiffness; the necessary strength will follow in a well designed press in which deflection is the major factor.

The three main members of a press—the crown, the slide, and the bed—are beam members. The usual and most economical section for these mem-

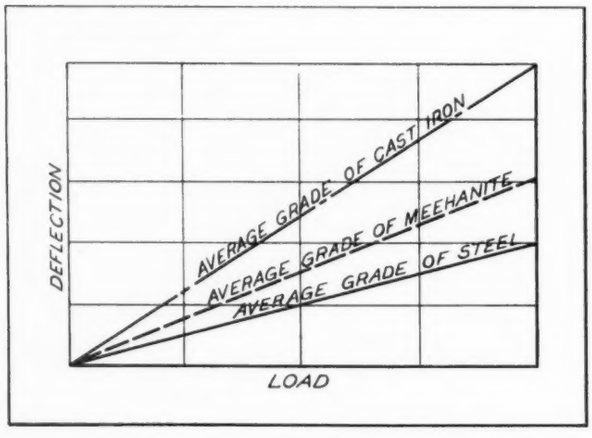


Fig. 1. Comparison of Deflection in Steel, High-strength Cast Iron, and Average Grade of Cast-iron Beams of Identical Section

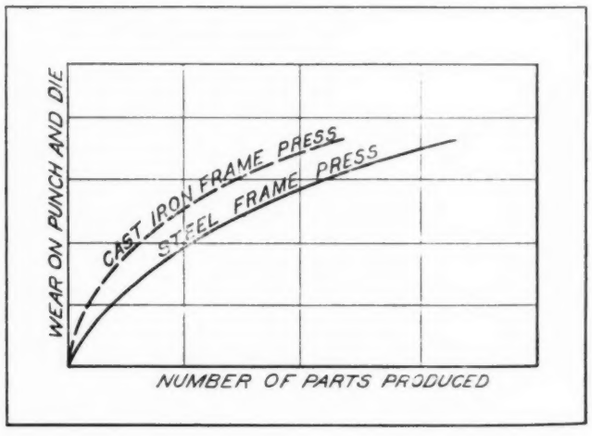


Fig. 2. Number of Parts Produced in Steel Frame and Cast-iron Frame Presses of Identical Section, as Recorded by Actual Experiments

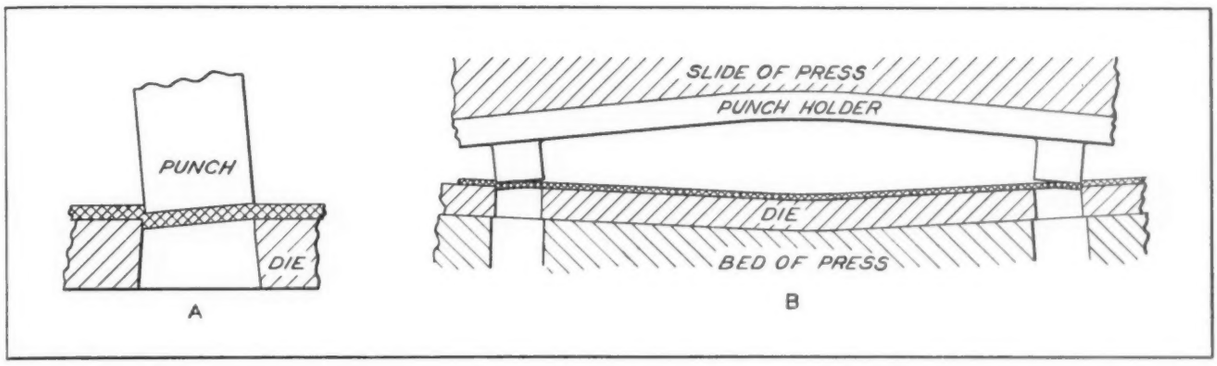


Fig. 3. Illustration Showing in an Exaggerated Manner the Effect of Misalignment of Punch and Die due to Deflection in Press Frames. (A) Shows Effect in a Gap-frame Press; (B) in a Long-span, Straight-sided Press

bers is the I-section. In a beam of this type, the deflection is dependent on the modulus of elasticity of the material used in the beam. The modulus of elasticity of an average cast iron is about 12,000,000. The modulus of elasticity of an average steel is 29,000,000. Hence, if two beams of equal section, one of cast iron and one of steel, were subjected to the same loading conditions, the deflection in the steel beam would be 12/29 of that in the cast-iron beam. This is shown graphically in Fig. 1.

In this respect, the question of high-strength cast irons must be considered. Meehanite is one type of high-strength cast iron of which press frames are frequently made. Meehanite is available in various grades with minimum tensile strengths ranging from 30,000 to about 55,000 pounds per square inch. The moduli of elasticity of these irons, according to the specifications chart distributed by Meehanite foundries, range from 12,000,000 to 23,000,000. An average grade of Meehanite, therefore, would be a grade of 45,000 pounds tensile strength with a modulus of elasticity of, say, 19,000,000. The deflection in a beam made of this grade of Meehanite, as compared with an average cast iron and steel beam, is also shown graphically in Fig. 1. The average Meehanite beam would be 1 7/12 times as stiff as an average cast-iron beam, but would only be 19/29 as stiff as an average steel beam.

In connection with Meehanite, it is interesting to note that as its tensile strength increases, its ability to absorb vibration is decreased. The 55,000-pound Meehanite has only two-thirds of the damping capacity of 30,000-pound Meehanite.

Just what is the advantage of this greater stiffness to which we have already referred? The writer has conducted extensive tests relative to the subject of deflection in presses. The greater deflection in the average cast-iron frame press is injurious to the punch and die used in the press. In straight-sided presses of small bed and slide area, the deflection of frame members is principally in line with the vertical center line of the press. The deflection in this type of press causes a "snap-through" of the press after punching operations, due to the load on the frame being released suddenly. This sudden releasing of the load allows the frame to spring back to its original undeflected state with a "snap," and it is this "snap" that causes excessive wear of the punch and die. This "snap-through" and its attendant vibration in cast-iron frame presses is much greater than in steel presses, due to the greater deflection of cast iron.

The writer also found that, in gap-frame presses, where the deflection under load opens up the C-frame and throws the punch out of line with the die, the greater deflection of the cast-iron press, and its resultant damage to the punch and die, was very evident.

Fig. 3 shows in an exaggerated manner the position of punch and die in a gap-frame press just before the part is blanked. In a straight-sided press of large span, the same condition exists. The bed and slide become deflected and throw the punches out of line with the die openings.

Tests were made by a large user of presses to verify these hypotheses. Two gap-frame presses of identical design, except that one had a cast-iron frame and the other a steel frame, were chosen for the tests. The sections of the frames were alike in both presses. All mechanical conditions had been equalized. A blanking and perforating punch and die were run alternately in the cast-iron and steel frame presses. The punch and die were removed from each press after they became dull enough to cause the parts being made to be rejected by the inspectors because of excessive burr. Four "runs" of the punch and die were made in each press with the results shown in Fig. 2. As may be seen, the punch and die in the steel press produced 40 per cent more parts per run than the same punch and die in a cast-iron press. This represents quite a saving in die costs, as well as in die upkeep costs.

There is no question but that cast iron provides a harder wearing surface than untreated steel plate. However, all presses built by the company with which the writer is connected are equipped with heavy-walled renewable bronze bushings and liners at all points of wear. Bronze has long been recognized as an exceptional bearing material, and

because of the great variety of bronzes available, there is a bronze to suit every requirement.

Considerable reference has been made to welding and possible weld failure. Mr. Gibson, in his article in March, 1940, MACHINERY, page 130, dealt with this subject quite thoroughly. We must consider the human element, whether in casting or welding. Our company has continued to employ its original interlocked design which was used before adopting electric arc welding. As a consequence, all loads are carried in parent plate. With about three thousand of its steel presses in daily service, this company has yet to encounter a single case of serious weld failure.

William A. Hanley, New President of the A. S. M. E.

WILLIAM A. HANLEY, head of the engineering division of Eli Lilly & Co., Indianapolis, Ind., has been elected president of the American Society of Mechanical Engineers for the year 1941. Mr. Hanley was born in Greencastle, Ind., in 1886. He received the degree of Bachelor of Science in Mechanical Engineering at Purdue University in 1911. Twenty-six years later, Purdue awarded him the honorary degree of Doctor of Engineering.

Prior to attending Purdue University, Mr. Hanley worked five years for the Republic Steel Corporation and the Broderick Boiler Co. at their Muncie, Ind., plants. After graduating from Purdue, he entered the employ of Eli Lilly & Co., of Indianapolis, of which company he is now a director and head of the engineering division, which designs and supervises all engineering projects, construction, power, and maintenance for the corporation, its branches and subsidiaries, and, in addition, has charge of certain highly mechanized production departments. Shortly before the outbreak of the war in Europe, Mr. Hanley spent much time at Basingstoke, England, building a new manufacturing plant for the British subsidiary of the Lilly company.

Mr. Hanley became a member of the American Society of Mechanical Engineers twenty-seven years ago, and has ever since been active in the Society's affairs. He has served as a representative of the Society on the American Engineering Council, on the Committee of Local Sections, and on the Committee on Relations with Colleges. In 1927, he was elected a manager of the Society, and in 1930 he became a vice-president.

Mr. Hanley has contributed a number of articles on engineering and economic subjects to the technical press over a long period of years. He is a past-president of the Indiana Engineering Council, a member of the Newcomen Society of England, and a fellow of the American Association for the Advancement of Science. He is also a councilor of the Purdue Research Foundation.

National Power Show to be Held in New York

The Fourteenth National Exposition of Power and Mechanical Engineering will be held in the Grand Central Palace, New York City, December 2 to 7. With the opening of the exposition still over a month away, about three hundred manufacturers have closed contracts for space. It is evident that this year's exposition will be the largest show of its kind since 1930. The show is held during the same week as the annual meeting of the American Society of Mechanical Engineers, which takes place at the Hotel Astor, New York City, giving visiting engineers an opportunity to attend both the sessions of the meeting of the Society and the show.

The Lincoln Industrial Progress Award Program

The James F. Lincoln Arc Welding Foundation, Cleveland, Ohio, has published a booklet entitled "We Who Work at Our Industrial Jobs," which draws attention to the social and economic significance of industrial progress and pays a tribute to all in industry who possess the urge to improve present methods. The booklet also includes suggestions and directions for the participation in the $200,000 industrial progress award program sponsored by the Lincoln Arc Welding Foundation. Everyone in industry is invited to take part in the competition for an award, for his own benefit, as well as in the interest of industry.

Tool Engineers Meet in Cincinnati

THE semi-annual meeting of the American Society of Tool Engineers was held October 17 to 19 at Cincinnati, Ohio, with headquarters at the Hotel Gibson. As usual, the various sessions and the semi-annual dinner held in connection with the meeting were unusually well attended, the Society having achieved a reputation for the active interest shown by its members in the proceedings.

The first technical session, held Thursday evening, October 17, dealt with the subject "Should Industry Assume the Burden of Special Education?" At this meeting, a number of papers were presented, each treating of some phase of education for industrial work. F. E. Searle, head of the Ford Trade School, spoke on "The Importance of Engineering Preparedness," while Dr. R. C. Gowdy, dean of the College of Engineering and Commerce of the University of Cincinnati, addressed the meeting on "Cooperative Education." A paper entitled "Industry's Post Graduate Course" was presented by W. S. Dowman, assistant director of sales and office personnel of the Goodyear Tire & Rubber Co. Finally, George Schiele, chief inspector and member of the board of the Cincinnati Milling Machine Co., led the discussion on the various papers that had been presented.

The second session of the meeting was held in conjunction with the semi-annual dinner, Friday evening, October 18, at which the presiding officer was A. H. d'Arcambal of the Pratt & Whitney organization, West Hartford, Conn., who is president of the American Society of Tool Engineers. Mayor Stewart, of Cincinnati, welcomed the attending engineers. The Educational Committee of the Society, of which H. D. Hall is chairman, presented a progress report on its work. The principal address was made by Whiting Williams, industrial consultant, writer, and lecturer, who spoke on the subject "What We Can Learn from Europe."

The third session of the meeting, held Saturday morning, October, 19, dealt with the subject "Gear Finishing." At this meeting, Charles R. Staub, chief engineer of the Michigan Tool Co., spoke on "Shaving and Lapping Gears;" Otto H. Schafer, president of the Schafer Gear Works, dealt with "Production of Gears by Shaving and Lapping Methods;" I. J. Gruenberg, chief engineer of the Gear Grinding Machine Co., covered the subject "Grinding Process of Finished Gears;" and Charles Pfeffer, in charge of gear development and production of the Wright Aeronautical Corporation, spoke on "Production of Gears by the Grinding Process."

Visits to important plants in Cincinnati and in Dayton constituted an essential part of the well diversified program.

Cincinnati Meeting on Shell Manufacture

UNDER the leadership of the American Society of Mechanical Engineers, and with the active cooperation of the Army Ordnance Association and the American Institute of Mining and Metallurgical Engineers, a meeting on shell manufacture was held at the Hotel Gibson, Cincinnati, Ohio, Wednesday and Thursday, October 16 and 17. The meeting was attended by more than three hundred army and navy officers, engineers, and manufacturers. This was the second meeting on this subject held under the auspices of the American Society of Mechanical Engineers.

During the meeting, three sessions were held—two on shell forging and one on shell machining. On the subject of shell forging, the following papers were presented: "The Metallurgy of Shell Steel" by T. S. Washburn, metallurgist of the Inland Steel Co.; "Heating Shell Billets," by Professor W. Trinks, Carnegie Institute of Technology; and "Flow of Metal During Forging of Shell," by M. D. Stone, United Engineering & Foundry Co.

In the shell machining session, papers were presented on "Cooperation between the Government and the Machine Tool Builders," by Tell Berna, general manager, National Machine Tool Builders' Association; and "Classification of the Surface Finish of Shells," by H. J. Wills, Carborundum Co.

At the first shell forging session, introductory remarks were made by Edward A. Muller, president of the King Machine Tool Co., who is chief of the Cincinnati Ordnance District. At the second session, there was a discussion led by Frank Macconochie, professor of mechanical engineering at the University of Virginia, on the subject "Analysis of Shell Forging Equipment." At the shell machining session, there was a similar discussion led by Lucien I. Yeomans, of Lucien I. Yeomans, Inc., on "Analysis of Shell Machining Equipment."

At a luncheon held during the first day of the meeting between the two shell forging sessions, the principal speaker was J. B. Doan, chairman of the board of the American Tool Works Co., who is president of the Cincinnati Chapter of the Army Ordnance Association. At a dinner held in the evening after the second shell forging session, Col. E. N. Harmon, of the First Armored Corps, Fort Knox, Ky., gave an address on "Tanks in Action."

Bending Press Dies for Airplane Manufacture

Adjustable Dies with Removable Blocks for Forming a Variety of Special Sections, and Multiple Punch Sets for Piercing as Many as 150 Holes at One Stroke Speed Aircraft Production

By CYRIL J. BATH
Cyril Bath & Co.,
Cleveland, Ohio

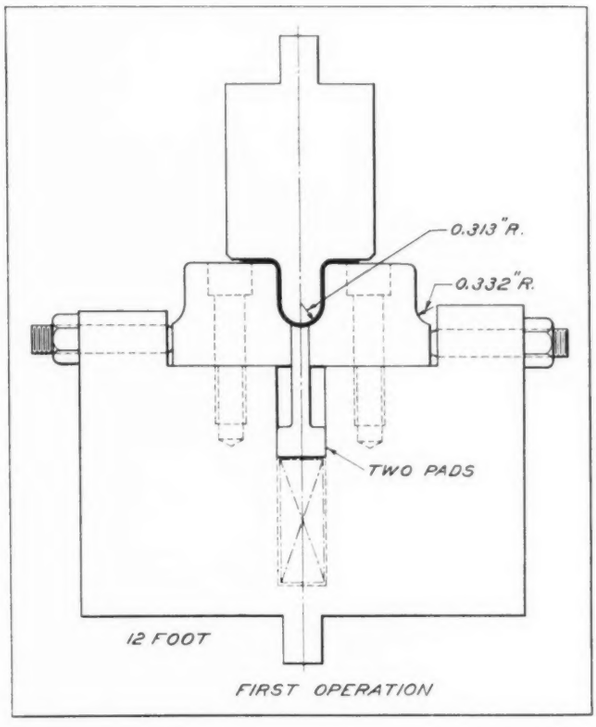


Fig. 1. Die for Forming Reinforcing Channels Produced in 12-foot Lengths for Airplane Work

BOTH the all-metal airplane and the all-steel bending press have been developed since the last war. The all-steel bending press has proved well suited for forming, bending, drawing, and punching the long slim metal sections used in airplane fuselage and wing construction. It is especially well adapted for forming the corrugations that stiffen the skin or thin metal covering material, and for forming the special curved sections by the use of hard-wood or cast-zinc dies. The long bed of the bending press is also used to advantage where the dies for several blanking, punching, bending, and drawing operations are set up in series for finishing pieces on a production basis in one handling.

Bending presses are also being used with free rubber sheets for forming odd shapes, and with rubber held in compression where the drawing requires greater pressure than that provided by the free rubber. In all these operations, the press functions effectively with low-cost dies. The self-locking power-setting of the ram and easily read micrometer dials facilitate rapid set-ups. A special clamping device is used to hold the dies or punch members in the ram, which automatically aligns the dies and makes special holding devices unneces-

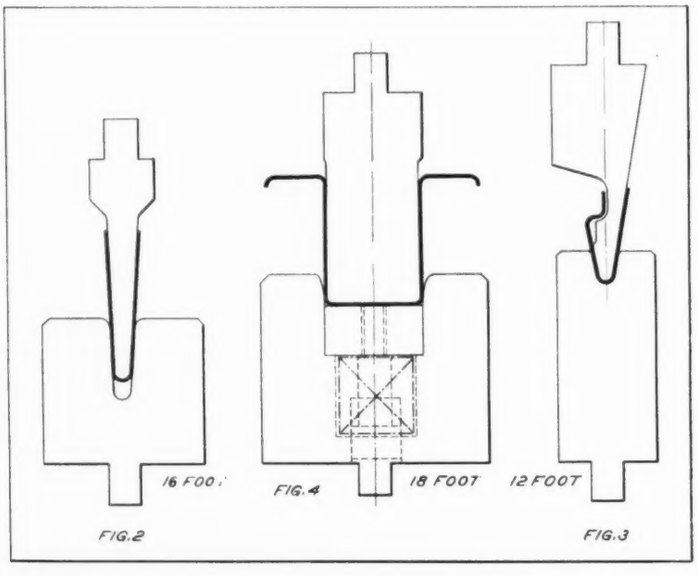


Fig. 2. Typical Die for Producing Deep Bend in Preliminary Operation on 16-foot Strips. Fig. 3. Die for Performing Second Operation on a Stiffening Member Made in Lengths up to 12 Feet. Fig. 4. End View of Die for Performing Second Operation on Stiffening Channels in Lengths up to 18 Feet

sary. Punch loadings can be instantly checked with the load indicator. The steel construction of the press, together with anti-friction bearings and other modern design features, provides a design which has an unusually high power input per pound of metal used.

Operating speeds can be varied to suit the work. Punching, for instance, may be performed at a speed of 90 strokes per minute, whereas in the case of bending operations on long sheets, a speed of not more than ten strokes per minute is desirable —faster speeds would result in whipping of the sheet, which would, in turn, cause reverse bends. The disadvantages of deflection and sticking on center have been practically eliminated in presses of modern design.

Operations of widely varying nature involve the use of many different dies and tools. Conventional steel dies are used where the shapes formed have fairly sharp angles, where very high pressures are required, or where the number of pieces to be produced justifies the die cost. It is possible, however, to keep down the cost by combining in one die setup a variety of inserts. For instance, in practically all airplane manufacture special channel-shape sections are used. Many of these channels have a stiffening flange formed or turned over at the end of each leg. Adjustable dies with removable blocks can be used for a variety of sizes.

It must be borne in mind that while the alloys used in airplane construction have a tensile strength of around 40,000 pounds per square inch when the work is started, the strength of the material will increase quickly up to 60,000 pounds per square inch or more under the cold-working effect of the dies. In cases where the pressure involved is not high, and it is simply desired to obtain a curved form without sharp bends, wooden dies, sometimes provided with metal edges, are used. Zinc castings may also be used in such cases.

The die shown in Fig. 1 for making small reinforcing channels is typical of the designs employed in airplane work. The lower member of this die is made up of parts that can be reversed to produce slightly different shapes without involving the ex-

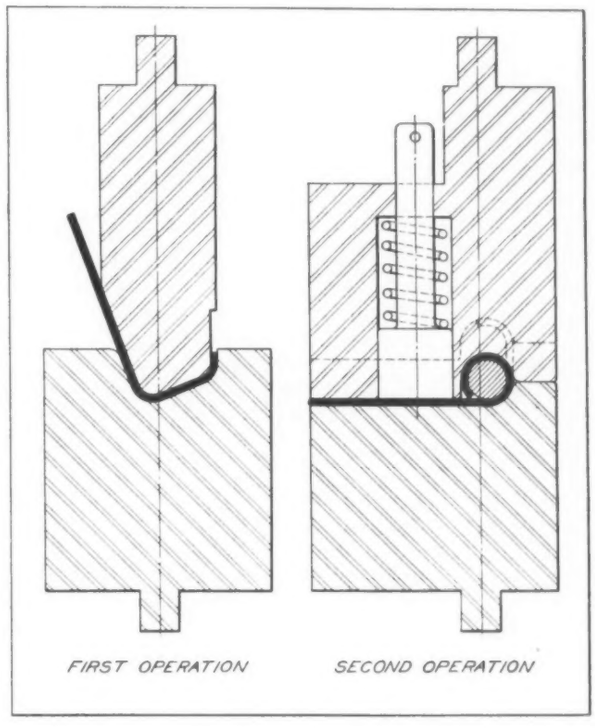


Fig. 6. Cross-section Views of Two Curling Dies Employed in Aircraft Work

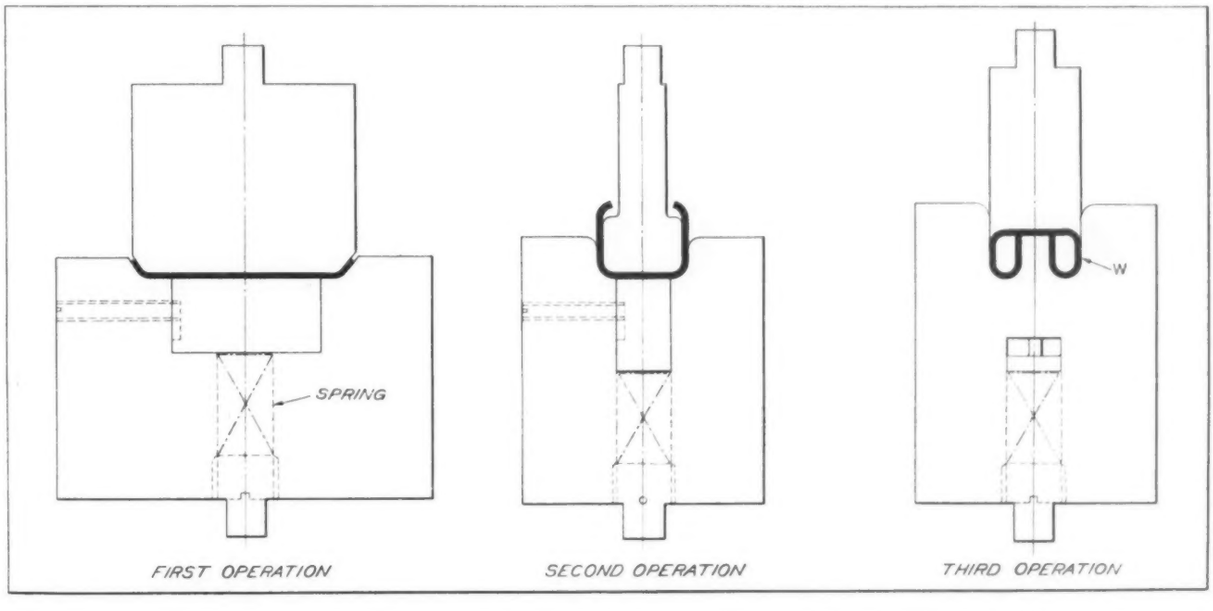


Fig. 5. End Views of First-, Second-, and Third-operation Dies for Producing Channels of Cross-section Shown at W

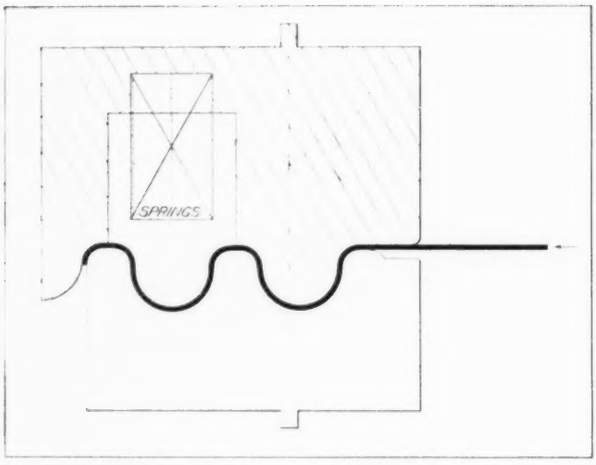


Fig. 7. Cross-section View of Die for Corrugating Sheet Material Used in Aircraft Construction

pense of a new die. Similar inserts can be provided for producing channels of various shapes.

In Fig. 2 is shown a typical die for producing a deep bend in a preliminary operation. A die for performing a second operation on a stiffening member is shown in Fig. 3. Another die for producing a stiffening channel is shown in Fig. 4. It will be noted that the latter die is fitted with a spring pad. Cross-section views of first-, second-, and third-operation dies used in a bending press for producing curled sections are shown in Fig. 5. A cross-section of the channel produced by these dies is shown at *W*. Cross-section views of two other curling dies used in aircraft production work are shown in Fig. 6. The corrugating die illustrated in Fig. 7 is of the type used in presses like the one shown in Fig. 8, which is also used for multiple punching.

The multiple punching of riveted holes in aircraft work, although employed for some time abroad, has only recently been approved in the United States. However, the trend is now toward this practice, as the multiple punch set-ups maintain greater accuracy in the spacing of the holes, and the use of punches with their close clearances in the dies eliminates trouble from burrs and lessens the possibility of fracture.

An interesting example of a press brake used as a multiple punch is illustrated in Fig. 8. This is a universal multiple punching outfit involving as many as 150 punches in one set-up, with the punches spaced 11/16 inch between centers. The punches range from 1/16 to 3/16 inch in diameter. The clearance between the punches and dies is 0.0015 inch. The upper or punch member is of the heavy stripping type, adjustable and "gagged." The "gag" is so arranged that any broken punch can be removed and replaced quickly without disturbing the other tools.

The die member is so built that channels and V-shape sections can be punched close to the legs or edges. Sheets can be passed through the machine without interference. The punch and die members are locked together while being adjusted, and accurate settings are insured by vernier readings. The gage used in this instance is very accurate, and will hold the spacings between the lines of punched holes within limits of 0.002 inch. The bed and ram have special stiffening members designed to maintain alignment tolerances that, for ordinary work, would be considered very exacting. The work produced with these punches is free from burrs, the metal is undistorted, and the punched holes have a polished appearance.

Frequently, the press is used simply as an actuating member for sub-presses which hold the punches. The use of these sub-press punches is limited by the depth of the punch throat. Large sheets cannot be punched in the center by this means. Some punches are designed to be mounted on a fixed cross-bar located between the housings of the press, the purpose of which is to maintain the alignment of the punches, while the ram is used only to provide the required pressure. Either of these methods is considerably less costly than the individual punch set-up shown in Fig. 8, although less frequently employed.

Spring-, air-, or rubber-actuated hold-downs are used for drawn sections, the same as in conventional presses. Quite a variety of blanking work

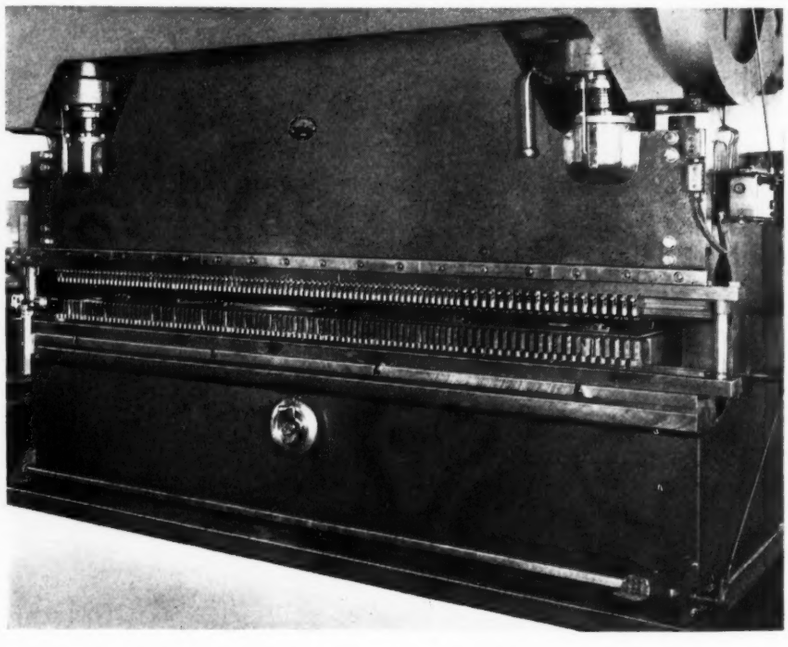


Fig. 8. Bending Press Set-up for Punching 150 Accurately Spaced Holes in One Stroke

requires press beds that are wider than those usually furnished on bending presses. For such requirements, special brakes with beds up to 36 inches in width are available. Such presses usually have angle-plates bolted to the front and the back of the ram to give it better support. Presses of this kind are generally employed on relatively light work.

Because of the limited production in some branches of the aircraft industry, many punch or die members of complicated shapes are made of wood or plaster-of-paris. Zinc castings are also used for both the upper and lower die members. Dies constructed from this material have a sufficient life for limited production.

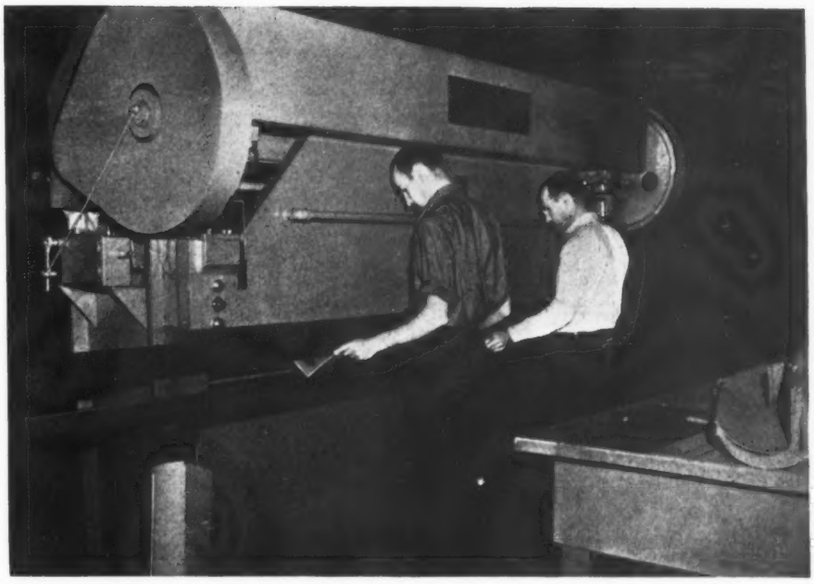


Fig. 9. Bending Press Equipped with Rubber Dies for Forming Flat Sections into Curved Members for Aircraft Wing and Fuselage Assemblies

Sometimes the upper or lower forming member can be used in connection with rubber pads, as previously described. In fact, while the use of rubber for this purpose is not new, it has been developed by the aircraft manufacturers to such a degree that it now serves the double purpose of keeping down die costs and reducing the probability of damage to the metal being worked. It is of vital importance, in working the aluminum alloys used in airplane manufacture, that the surface of the metal be kept free from scratches or bruises that might remove the outside coating, because where this occurs, corrosion is more likely to start. For this reason, inspectors will not accept sheets that have been scratched or damaged. Rubber and wooden dies have been used in many cases, not only because they are less expensive, but also because they are less likely to damage the material.

In Fig. 9 is shown a Model A Sturdybender equipped with rubber dies for forming flat sections into modulated curves for aircraft wing and fuselage assemblies at the Vultee Aircraft plant.

Systematic Directions for Training Industrial Workers Prepared by National Metal Trades Association

AS pointed out by the National Metal Trades Association, the training of industrial workers is just as important as the training of soldiers and sailors to the success of the National Defense Program. During the World War of 1914 to 1918, the shortage of skilled labor greatly hampered the production of armaments and emphasized the importance of industrial preparedness.

With this in mind, the National Metal Trades Association has been developing a simple plan that can be easily applied for training inexperienced men to become machine operators in the shortest possible time. There are two basic questions back of any training program: (1) What does the learner need to know? and (2) What is the best way to show the learner what he needs to know at a time when he should know it?

To assist everyone in the shop who has anything to do with training in carrying out a proper training program, the Association has made available a series of instruction outlines dealing with the training of men for assembling work, and drill press, engine lathe, turret lathe, milling machine, grinding, shaper, planer, and boring-mill work. These outlines purposely do not deal with the detailed information or facts to be conveyed to the learner; nor do they specify how to present them. They do, however, serve as a check list of the instruction points that must be covered if the new employe is to learn to do his job well. They are intended to be a guide for the man who is giving the instruction, and are not prepared for self-instruction.

The Association also publishes textbooks for apprentices that furnish general information on the uses of machine tools and their method of operation. Any company faced with the necessity of training can obtain detailed information concerning this program by communicating with the National Metal Trades Association, 122 S. Michigan Ave., Chicago, Ill.

The National Metal Exposition

At the National Metal Exposition held in Cleveland October 21 to 25, over three hundred manufacturers in the metal industries, occupying more than 100,000 square feet of exhibit space, showed products from practically every branch of the metals and allied industries. As much of the new equipment and many of the new materials exhibited have already been described in MACHINERY, and others will be described in the near future, only a few of the exhibits will be mentioned in this brief review.

The General Electric Co. announced a new atmosphere gas for heat-treating steels without surface decarburization, known as "Drycolene." This gas has been developed as a protective atmosphere for such operations as scale-free hardening, bright annealing, sintering, and electric furnace brazing of high-carbon steels, where surface decarburization, carburization, or oxidation must be avoided.

Bright hardening of high-carbon steels in a controlled-atmosphere electric furnace without decarburization was also one of the features of several demonstrations by the Westinghouse Electric & Mfg. Co.

The Linde Air Products Co. demonstrated the latest developments in the oxy-acetylene cutting and flame-conditioning processes, as well as Unionmelt welding. Among the equipment featured was a new oxy-acetylene bar-cutting machine especially adapted to steel mill cutting-off operations. A portable cutting machine equipped with a new radial arm support was also shown.

The Lincoln Electric Co., conforming to its past record of exhibits at the Metal Expositions, had an unusually complete array of welding machines, electrodes, and accessories, in addition to demonstrations of the quality of welded joints. Recently developed welding equipment and accessories of different types were also exhibited by the General Electric Co., the Westinghouse Electric & Mfg. Co., the Harnischfeger Corporation, the Federal Machine & Welder Co., the Progressive Welder Co., the Taylor-Winfield Corporation, and a score of other companies.

Exhibited for the first time by the Carboloy Co. was a line of special die-finishing equipment designed to effect important reductions in die costs for producers of shaped wire, bars, and rods. The new equipment will permit mills to finish their own dies to exact shape from semi-finished Carboloy dies. The company also featured the new "universal" low-priced standard cutting tools recently announced, and a chip-breaker grinder for steel-cutting tools.

The Haynes Stellite Co. featured the unusual corrosion and wear resistance of Haynes Stellite alloys, such as Hascrome and Hastelloy. The corrosion-resistant properties were demonstrated by dipping samples in boiling acid solutions. Cutting tool tests for red hardness were also conducted, especially featuring Haynes Stellite J-Metal.

The Air Reduction Corporation, together with its affiliated companies—the National Carbide Corporation and the Wilson Welder & Metals Co., Inc.—featured demonstrations of flame cutting, flame cleaning, and bronze welding. Electric welding machines of different types were also shown.

The New Jersey Zinc Co. had a very comprehensive exhibit of die-castings for practically every branch of industry. It is especially worthy of note that the sizes of die-castings are constantly increasing and that more and more complicated shapes are being die-cast.

One of the unusual devices exhibited was the Electric Master Mind introduced by the Harris Calorific Co., a device that records how well or how poorly an operator performs a job of arc welding. Red and green lights on the control instrument and in the head shield indicate the quality of the welding. This device has been extensively used under a wide variety of conditions.

Several new cleaning materials that were developed for use in connection with the electrocleaning process and are used in manufacturing and aviation plants for the removal of oil, greases, and buffing compounds were exhibited for the first time by Oakite Products, Inc.

A complete line of temperature measuring and controlling equipment was shown in operation by the Leeds & Northrup Co., including devices ranging all the way from a portable optical pyrometer to the Micromax recording controller. Displayed for the first time was a Micromax electric control mounted on a steel panel and wired as a unit, ready for installation. A Vapocarb-Hump hardening furnace and a Homo tool-tempering furnace were also shown in operation.

Control instruments for high and low temperatures, used in the heat-treatment of metals and other materials, were featured in the exhibit of the Bristol Co. Among these was the "Pyromaster," which was shown both as an electric controller and as an air-operated controller.

The Brown Instrument Co. featured pyrometers of different types, thermometers, and pressure gages. The company also demonstrated the "Protectoglo" system, a combustion safeguard utilizing the electrical conductivity of the flame itself to give positive protection against flame failure.

In the testing equipment field, the Baldwin-Southwark Division of the Baldwin Locomotive Works made the first public demonstration of the new bonded "Metalectric" strain gages, which are made in both a static and a dynamic type. According to the manufacturer's statement, the static type will measure a stress of 20 pounds per square inch in steel, and the dynamic model will take care of frequencies up to 30,000 per second.

Gear Manufacturers Discuss Industry Standards

THE semi-annual meeting of the American Gear Manufacturers Association, held at Skytop, Pa., October 14 to 16, was devoted largely to work pertaining to engineering and industrial standardization, an activity that has always been one of the chief concerns of the Association. The meeting was unusually well attended, almost all of the member companies being represented. The Association now includes among its members practically every gear manufacturing concern in the United States and Canada, the present membership numbering 109.

The meeting was opened by the president of the Association, U. Seth Eberhardt, vice-president of the Newark Gear Cutting Machine Co., who referred briefly to Association activities. The importance of the Association's standardization work was emphasized by the manager-secretary, J. C. McQuiston. There have been forty-eight meetings since the formation of the Association, all but the very earliest ones of which have been chiefly concerned with the standardization of gearing.

Several important papers and addresses were presented before the meeting. S. L. Crawshaw, of the Westinghouse Electric & Mfg. Co., spoke on the subject "The Selection of Bearings for Gear Drives." An abstract of this paper will be published in a coming number of MACHINERY. "Credit Unions" was the topic covered by E. S. Sawtelle, of the Tool Steel Gear & Pinion Co. This paper brought out a great deal of informative discussion. Philip P. Gott, of the Chamber of Commerce of the United States, spoke on "Government, Business, and Associations."

"Motion Characteristics of Silent Chains" was the subject dealt with by H. A. McAninch, of the Link-Belt Co. B. A. Miller, of the Cramp Brass & Iron Foundries Co., read a paper entitled "Metals which We Believe Have Application in Worm Gearing." An abstract of this paper will be published in a coming number of MACHINERY.

The wide scope of the standardization activities was well brought out by the report of the Technical Standards Committee, of which T. R. Rideout, of the Westinghouse Electric & Mfg. Co., is chairman. Progress reports were presented by practically all of the committees, and special reports were made by the Enclosed Gear Drive Committee and the Lubrication Committee.

Machine Tool Dealers Consider Problems Created by Defense Program

THE annual meeting of the Associated Machine Tool Dealers of America, held at the Hotel Biltmore, Dayton, Ohio, October 21 and 22, was to a large extent concerned with the conditions created in the industry by the National Defense Program. This was to be expected, since no industry is more directly affected by armament production than the machine tool industry, machine tools being required for the production of all munitions.

The meeting was opened by the Association's president, John Sauer, Jr., of the Peninsular Machinery Co., Detroit, Mich. Later followed an address on "Training Apprentices," by D. H. McKellar, of the Monarch Machine Tool Co., Sidney, Ohio, in which the speaker outlined the principles on which a successful apprentice training program must be founded, with especial reference to the work that has been done at the Monarch plant.

An address that referred to one of the most important problems created by the accelerated armament production was that by Albert M. Stedfast, of Stedfast & Roulston, Inc., Boston, Mass., on "The Government Plan to Commandeer Machine Tools on Order." Other addresses were made by A. B. Einig, of the Machine Tool Division of the Advisory Council of National Defense, Washington, D. C., who spoke on "Machine Tools and the National Defense Program," and by Tell Berna, general manager of the National Machine Tool Builders Association, who spoke on "Priorities under the Defense Program."

At the annual dinner, held on the evening of the first day of the meeting, an address of welcome was made by the Honorable Charles J. Brennan, Mayor of Dayton, after which Colonel H. A. Toulmin, Jr., made an inspiring address on "Organizing for War." At a later session of the meeting, A. G. Bryant, of the Bryant Machinery & Engineering Co., Chicago, Ill., spoke on "Selling for Delivery in 1950."

The following officers were elected for the coming year: President, F. B. Scott, Jr., of Syracuse Supply Co., Syracuse, N. Y.; vice-president, Albert M. Stedfast, of Stedfast & Roulston, Inc., Boston, Mass.; secretary-treasurer, F. W. Schiefer, of F. W. Schiefer Machinery Co., Rochester, N. Y. The new members elected to the executive committee were: Edward A. Lynch, of Edward A. Lynch Machinery Co., Philadelphia, Pa.; T. C. Stephens, of Robert R. Stephens Machinery Co., St. Louis, Mo.; and A. G. Wigglesworth, of Wigglesworth Machinery Co., Cambridge, Mass.

Resistance "Forge-Welding" Permits Spot-Welding of Heavy Sections

A NEW heavy-duty electric resistance welding process known as "forge-welding" makes it possible to spot-weld heavy steel and iron sections heretofore considered impossible to weld with conventional equipment. With this process, such work can be spot-welded almost as easily and rapidly as sheet metal.

The process, developed by the Progressive Welder Co., Detroit, Mich., promises to open up new fields for resistance welding in the fabrication of structural steel assemblies. Thus, the fabrication of heavy sections for war equipment, which are expected to come within its capacities, may prove to be of considerable importance in the Defense Program.

In principle, the process goes back to one of the earliest methods of welding, from which it derives its name. In comparison with early forge-welding methods, however, the new process is extremely rapid. Typical examples of work being handled in this way are the welding of two pieces of 3/8-inch stock to a 1-inch section, and the welding together of two 1-inch sections.

Spot-welder Equipped with Compound Air-pressure Cylinders. A Steady Pressure is Exerted on the Work by the Lower Cylinder, while a Hammering Action is Provided by the Upper One

The method consists of applying first pressure to the work and then interrupted current, after which a hammering action is superimposed on the electrode. Under high pressure and with sufficient heat, the surfaces of the work are brought into such intimate contact that when additional impact pressure and intermittent heat are applied, a "forged" weld of superior quality is obtained.

To secure the forging effect and still hold the work under pressure, a compound-action "Hydro-Booster"—another recent development—is used. With it, a rapid succession of blows can be superimposed upon the initial constant pressure under which the work is being held.

The equipment consists of a pedestal type holder having the compound "Hydro-Booster" mounted on the upper arm immediately above the welding electrodes. The booster consists of two chambers, one above the other, each receiving air from the usual 90-pound factory line. The piston of the upper chamber can act on the top of the lower piston to increase the resultant welding pressure. In this manner, the lower piston supplies the necessary initial pressure, while the upper piston, acting independently, superimposes the hammer-blows required for the operation. Thus, the initial pressure of 2000 pounds, together with sufficient heat, brings the surfaces of the work into intimate contact, and the combination of interrupted heat and intermittent hammering (approximately 1000 pounds per blow) completes the weld.

The special equipment required is of the "accessory" type. A timer that can control the sequence of operations for any condition yet encountered is used. A special-alloy electrode has been developed to withstand the high pressures and heat.

Portable spot-welding guns can be used for resistance "forge-welding," primarily on work up to about 1/2 by 1/2 inch. With such equipment, the process differs in that pressure is applied in two stages—first, a welding or contact pressure, and then a heavy "squeeze" or forging pressure. Obviously, a "forge-welding" head would be too cumbersome with the portable gun.

* * *

The American Gear Manufacturers Association reports that gear sales for the nine months ending with September this year were 46 per cent above those for the corresponding period last year.

Riveting Block Designed to Prevent Distortion of Small Grooved Stud

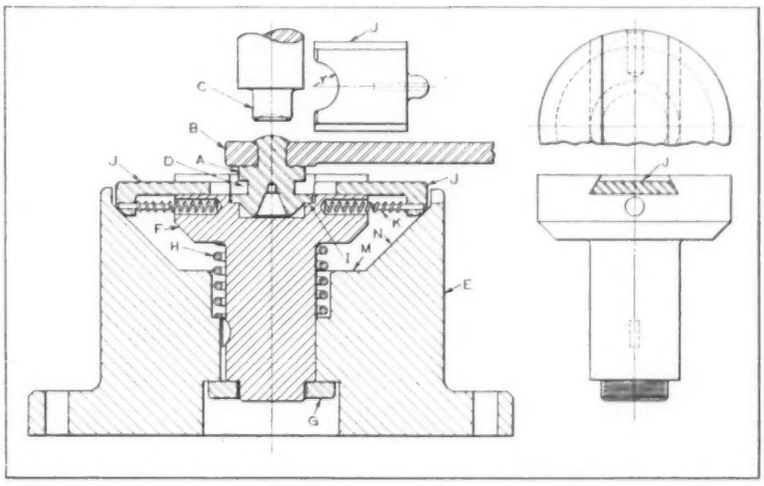
By W. M. HALLIDAY, Yorkshire, England

In riveting small brass studs, like the one shown at *A* in the illustration, to steel arm pieces, such as indicated at *B*, the pressure exerted by the riveting punch *C* had a tendency to distort or close in the groove *D*. Originally, the parts were held in a block having a small blind hole in which the grooved stud was so located that the force of the punch was taken by the end face of the stud. The simple fixture illustrated was designed to eliminate distortion of the rivet groove. In addition to accomplishing this purpose, it also served to increase production and insure a uniform product.

The flange at the base of the cylindrical cast-iron body *E* of the fixture is drilled for four hold-down bolts by means of which the fixture is clamped to the platen of the riveting machine. The round shank of member *F* slides freely in body *E*, and is prevented from turning by a small key, which is a sliding fit in a keyway cut in the body. The threaded ring *G* holds member *F* in place against the force exerted by compression spring *H*.

Member *F* has a recess at its upper end which is slightly larger in diameter than the stud and is stepped to allow a shoulder of the stud to rest on the locating surface or step at *I*. The function of spring *H* is to keep member *F* in its uppermost position, except when forced down during the riveting operation, and to insure its immediate and automatic return when the riveting operation has been completed.

The inner ends of the dovetail slides *J* are formed to a radius *r*, as shown in the upper plan view, to suit the diameter at the root of groove *D*. Thus when both slides are moved inward until their ends meet, the groove in the stud is completely filled. The outer ends of these slides are stepped and rounded. The slides move freely in the guide-ways. Small pins are located in the stepped ends of the slides to act as guides for springs *K*. The upper end of the conical-shaped bore in base *E* makes contact with the ball-shaped ends of slides *J* when they are in the open position, the contact being maintained by springs *K*.



Riveting Block with Slides J that Automatically Enter Groove D to Support Stud A while it is being Riveted to Arm B

The cycle of operations is as follows: First, brass stud *A* is inserted in the hole provided in arm *B*; and while the punch ram is withdrawn to its uppermost limit, the stud is inserted in the recess in member *F*, with the shoulder face in contact with the stepped part of the recess at *I*.

The machine ram is then tripped. On the downward stroke the punch comes in contact with stud *A*, carrying it, together with sleeve *F* and the assembled slides *J*, downward until the bottom face of the flanged end of member *F* bears against the straight step *M*. While this movement is taking place, slides *J* are caused to move inward by the conical surface *N*, so that the radius-shaped ends enter the groove in the stud.

When the bottom of the stroke has been reached, the riveting operation takes place. Upon the withdrawal of the riveting ram, sleeve *F* is raised through the pressure exerted by spring *H*, and, at the same time, slides *J* are withdrawn so that they clear the groove in the stud, which can then be removed from the fixture. The outward movement of slides *J* is effected by springs *K*. With the fixture arranged as shown, all distortion of the groove or bore in the stud is eliminated, as the pressure of the rivet set when performing the heading operation is taken by slides *J*.

Gravity-Fed Piercing and Cutting-Off Die

By JOSEPH I. KARASH, Tool Design Department
Reliance Electric & Engineering Co., Cleveland, Ohio

A quantity of parts such as shown at *A*, Fig. 1, were to be made from 13-gage sheet steel. The parts were approximately 1 1/2 by 2 1/2 inches with a 1-inch hole. The material used for making these parts was first sheared into long strips 1 1/2 inches wide. These strips were then fed into the piercing and cutting-off die shown in Fig. 2. This die was designed for operation in an inclined press at an angle, as shown in the illustration, so that the stock is fed to the die by gravity.

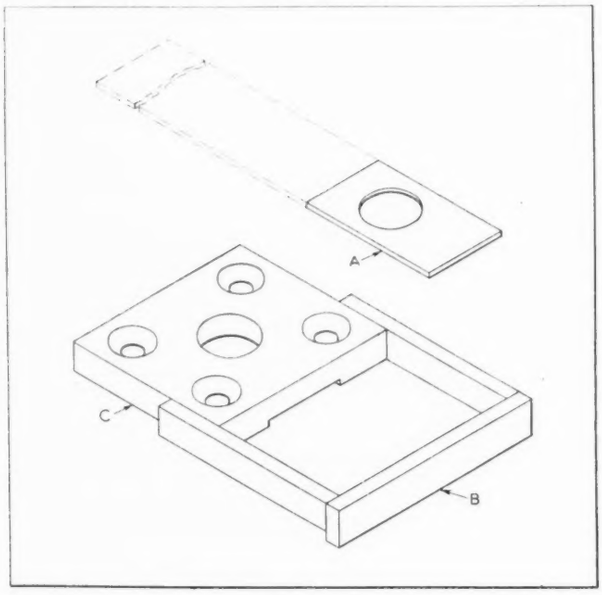


Fig. 1. Pierced and Cut-off Piece A, and Stripper Plate C with Stop B Used on Die Shown in Fig. 2

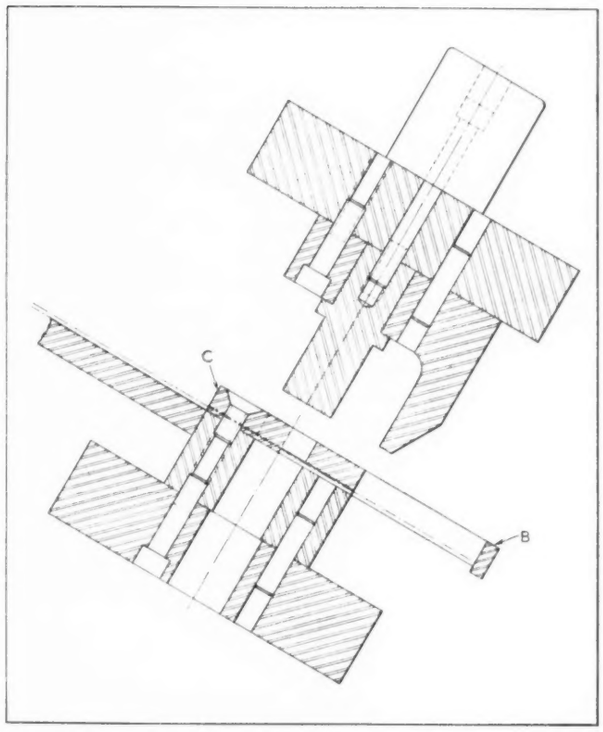


Fig. 2. Two-stage Gravity-fed Die for Producing Piece A, Fig. 1

It should be noted that in the construction of the die the stock gage *B* was secured to stationary stripper plate *C*. Had the stock gage been secured to the die-shoe, it would have been necessary to use a much larger shoe. It would also have been necessary to cut a large hole through the die-shoe to allow the cut-off piece to fall through.

The specifications of the work did not call for close tolerances, and, consequently, it was permissible to have a free fit of the stripper plate slot on the strip material. If a stock support surface is provided, such as shown in the illustration, the strip stock will be free to slide through the die until it is stopped by the stock gage. Thus, if the press is run at a constant speed, the material will feed itself. On the down stroke of the ram, the material will be pierced and the cut-off piece will fall free. During the up stroke and the start of the down stroke, the strip material will again slide into position against the stock gage.

The operation cannot be considered automatic, because of the fact that it is a two-station operation. This necessitates momentarily stopping the ram action in order to position the new strip for the first punch. In entering a new strip into the die, the operator should allow it to project slightly beyond the cut-off line, so that the end of the stock can be shaved during the first-station piercing operation. The operator can then allow the stock to feed itself, the press running at a constant speed.

The press that was used had an inclined angle of 30 degrees. An angle of 45 degrees would probably give the best results. The running speed of the press was 48 strokes per minute, and the length of the strokes 3 inches. In using gravity feed on a punch press, the speed of the press will affect the performance. Should the running speed be too fast, the material would not have time to feed itself. This would necessitate stepping on the foot-pedal every stroke.

Though the die is quite conventional in appearance, it has some decided advantages from the standpoint of efficiency and safety. These advantages are realized with little increase in tool cost.

Efficient Lay-Out for Blanking Can Tops

By RONALD L. WAKELEE, Evanston, Ill.

The economical, close-spaced, blanking lay-out shown in the accompanying illustration is made possible by scroll-shearing the sheet material preparatory to automatic handling in single- or double-die suction strip-feed presses. The scroll shear is arranged to trim the ends of the sheet and cut it up into a series of scroll strips, as indicated by the irregular lines *L*. The two-row lay-out for double-die strip-feed presses may save up to 6 or 8 per cent in the material, according to the size of the lay-out. This method is especially adapted for producing the tops and bottoms of tin cans from tin plate obtained in sheet form.

The formulas given in the illustration facilitate the determination of the scroll-shear dimensions and sheet sizes. The values are given to five decimal places, but, of course, for practical results such accuracy is not required in the calculations.

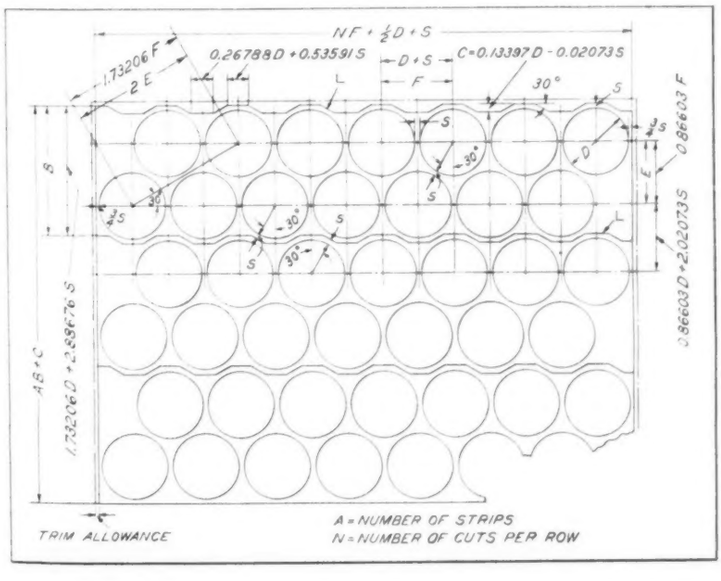
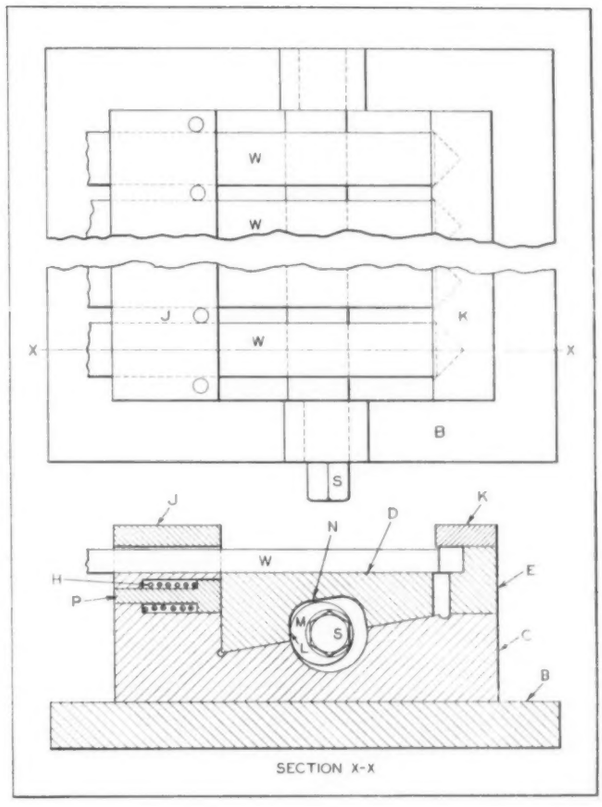


Diagram and Formulas Showing Economical Lay-out for Blanking Can Tops from Sheet Metal



Chuck for Holding Work that Varies in Thickness

Self-Adjusting Chuck that Compensates for Variation in Work Thickness

By MARTIN H. BALL, Watervliet, N. Y.

A self-adjusting feature that compensates for variations in the thickness of work is incorporated in the chuck here illustrated. Base *B* has a work-supporting block *C* fastened to it which is cut out, as indicated, to provide clearance for cam *M*. Block *C* supports the wedge-shaped work-holding block *D*. Filler block *E* is made as a separate piece and fastened to supporting block *C* to simplify the drilling and reaming of the holes for plunger *P* and spring *H*. Work *W*, which rests upon block *D*, requires drilling to a specified uniform depth, measured from its upper surface, irrespective of the varying thickness of the individual pieces.

The illustration shows the fixture in its open or loading position. The pieces of work *W* are slid under retaining plate *J*, over block *D*, and under locating plate *K*. The opening that receives the work is only large enough to allow a piece of maximum thickness to enter. After the pieces are in position, a wrench is applied to the hexagonal end of camshaft *S* (which has bearings in base *B*) and turned in a clockwise direction, causing

the lobe of cam *M* to move away from its loading position. This allows spring *H* to force plunger *P* against sliding block *D*, thus raising the work-pieces snugly against retaining plates *J* and *K*.

The individual cam-blocks come to rest when the work strips that they support make contact with the retaining plates, one after the other, according to their various thicknesses. While this action is taking place, the lobe of the cam has moved to the right and is approaching the under surface of block *D* at point *N*. The relative vertical position of the lobe of cam *M* is not changed by the endwise movement of sliding block *D*, because surface *N* is at the same angle as the bottom of supporting block *C*. Thus, further rotation of camshaft *S* produces an equal final clamping effect on each of the work-pieces.

The opening between cam *M* and cam-block *D* when the chuck is in the open position, ready for loading, should be about 0.005 inch greater than the extreme variations in the thickness of the work-pieces. After the work has been drilled, the chuck is returned to its loading position by rotating camshaft *S* in a counter-clockwise direction until it reaches its original position, with the lobe of cam *M* making contact with sliding block *D* at point *L*.

Straightening Fixture for Removing Twists from Rectangular Bars

By LOUIS CHABRAND, Allier, France

A large number of steel bars of rectangular form were to be assembled in series in the construction of a certain unit. Although it was comparatively easy to produce bars of the required dimensions, it was difficult to eliminate the twists or helical distortion in the bars to bring them within the specified limits of straightness. The straightening fixture designed to solve this problem is shown in the illustration.

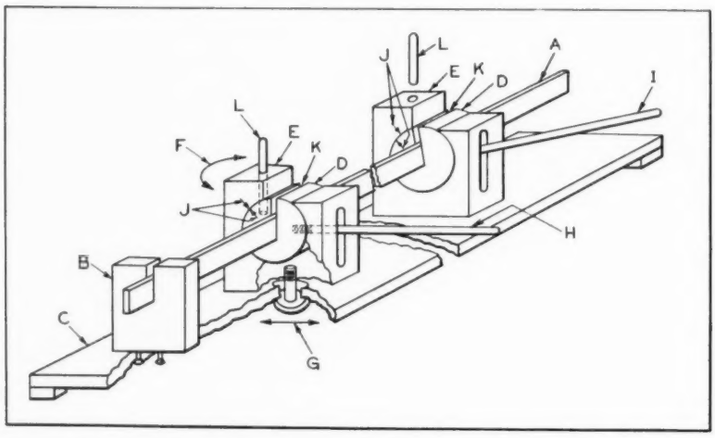
One of the bars to be straightened is shown in the fixture at *A*. It is supported at one end by block *B*, which is attached to the accurately machined flat plate *C*. The bar *A* fits the slot in block *B* with a minimum amount of play. It also fits the slots in cylinders *D*, the latter being free to turn in blocks *E* without play.

The axis of rotation of cylinders *D* coincides with the center of the rectangular bar *A*. Blocks *E* are free to turn or pivot in the directions indicated by arrows *F*, and can also be displaced laterally in the directions indicated by arrows *G*. The rotation of cylinders *D* is effected by means of levers *H* and *I*. Two graduations *J* indicate when the groove *K* is perpendicular to plate *C*, and there is a spring center or detent for holding cylinder *D* in position when slot *K* is in the perpendicular position. The pins *L* serve to lock blocks *E* and cylinders *D* together when slots *K* are perpendicular to plate *C*.

Before the steel bar is placed in the fixture for removing the distortion, it must be approximately straight. The pins *L* are disengaged when the bar is placed in the fixture. The lever *H* is first employed to straighten the portion of the bar between the fixed block *B* and the first cylinder *D*. Lever *H* is manipulated until the two graduation marks *J* coincide. When cylinder *D* is thus aligned, the slot *K* is perpendicular to the plate *C*. At this point, pin *L* is inserted, locking cylinder *D* so that it cannot revolve. Lever *I* is next manipulated to bring the graduations *J* on the second block and cylinder into alignment.

It may be necessary to employ more than two blocks *E*, depending on the length of the bars and the degree of accuracy required in performing the straightening operation. Before the bar is removed from the fixture, the pins *L* are disengaged to permit cylinders *D* to rotate freely. If the graduations *J* of all cylinders and blocks do not coincide, the straightening operation is repeated. This may have to be done several times before the required straightness is obtained, as determined by the graduations on the cylinders.

* * *



Fixture for Removing Twists from Steel Bars Like the One Shown at A

Orders received by the General Electric Co., Schenectady, N. Y., during the three months ending September 30, amounted to more than $185,000,000, compared with slightly less than $80,000,000 for the same period last year. This is the largest amount of new business ever received by the General Electric Co. in a three-month period.

It is stated that for the first nine months this year, orders received amounted to $397,810,000, also a record for such a period, compared with $248,582,000 for the corresponding period a year ago. Orders for the U. S. Government in connection with the Defense Program accounted for slightly more than one-fourth of the total business obtained so far this year.

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

Jurisdiction in Patent Suits

R. A.—Can a manufacturer whose plant is located in Detroit, Mich., and who sells an infringing article, be sued for infringement in San Francisco, Calif., because he has a manufacturer's agent in San Francisco selling the article for him in that territory?

Answered by Adelbert Schapp, Patent Attorney
San Francisco, Calif.

Under the law, the District Courts of the United States have jurisdiction of all suits at law or in equity arising under the Patent Laws. A defendant in a patent infringement suit may be sued in the district of which the defendant is an inhabitant, or in any district in which the defendant, whether a person, partnership, or corporation, has committed acts of infringement and has a regular and established place of business. To sue the Detroit manufacturer in San Francisco, the plaintiff must show, therefore, that the defendant has committed acts of infringement in that district and has a regular and established place of business there.

What is a regular and established place of business? If the Detroit manufacturer merely sells to a San Francisco hardware or machinery merchant, for resale by the latter to the general public, that does not constitute a regular and established place of business for the Detroit manufacturer in San Francisco, because the articles change hands before they are resold. But if the Detroit manufacturer has an agent in San Francisco who sells the merchandise for him, the situation is different. Contrary to general opinion, it does not seem to make much difference whether the manufacturer's name appears on the door of the agent, or in the San Francisco telephone directory, or on the agent's stationery. The principal point is whether or not the Detroit manufacturer keeps a stock of goods on hand in San Francisco from which the agent sells directly to the customer.

If the resident agent merely solicits orders to be forwarded to the Detroit manufacturer and to be filled from stock in Detroit, that does not constitute a regular and established place of business in San Francisco; but if the resident agent has a stock of goods on hand belonging to the Detroit manufacturer and sells and delivers directly from stock to the customers, that constitutes a regular and established place of business, and any party whose patent is infringed by such sales may sue the Detroit manufacturer in San Francisco. This is true even though the agent conducts the business under his own name and represents additional manufacturers, and outwardly there is nothing to connect him with the manufacturer in Detroit. Of course, where the sales thus made are merely incidental and sporadic, or are confined to used samples, they might not be sufficient to establish jurisdiction; an exact rule is difficult to establish.

What Type of Cast Iron Will Resist Caustic Corrosion?

A. C. H.—What type of cast iron is most suitable for use in contact with caustic solutions?

Answered by Editor, "Nickel Cast Iron News"
International Nickel Co., Inc., New York City

Considerable quantities of castings containing nickel in two groups of percentages—from 2 to 3 per cent and from 4 to 5 per cent—have been used for this purpose, especially in the paper industry where caustic solutions are employed to a great extent. A cast iron frequently used for this purpose would have approximately the following composition: Total carbon, 3.30 per cent, maximum; silicon, 2 per cent, maximum; manganese, from 0.40 to 0.70 per cent; nickel, from 2 to 3.5 per cent; and chromium or molybdenum, 0.50 per cent maximum. Somewhat better corrosion resistance can be obtained by using a nickel content in the higher group, up to 5 per cent.

A Ni-Resist composition containing approximately 20 per cent nickel may be used where a much higher degree of corrosion resistance is needed. The range of nickel irons having from 6 to 18 per cent of nickel are relatively hard and are difficult to machine; hence, compositions of this type are not recommended. Cast iron under 280 Brinell in hardness can be readily machined when the structure and hardness are uniform, as is the case with nickel irons.

* * *

An alloy that has found expanding use, especially in the marine field, is composed of 70 per cent of copper and 30 per cent of nickel. This alloy is used for condenser tubes, where its economy has been established over lower-priced compositions. It is also being employed for pipe lines handling sea water, as well as for drain pipes and valves and fittings for salt-water lines.

Production of Machine Tools in 1939 and 1937

Compiled by the Bureau of the Census

Class	1939		1937*	
	Number	Value	Number	Value
Machine tools (including replacement and repair parts), aggregate value	—	**$177,593,520**	—	**$169,683,240**
Boring machines:				
Horizontal boring, drilling, and milling combined	341	5,253,464	326	3,798,542
Vertical (not vertical boring mills)	52	285,921	44	306,498
Special types				
Precision boring machines, including jig borers	702	2,928,355	508	2,072,640
Other types	33	434,489	49	537,067
Boring mills (vertical, including vertical turret lathes):				
General-utility (59" table and under)				
With side-head	312	3,245,851	447	2,962,759
Without side-head	—	—	21	198,160
Heavy-duty (above 59" table), with or without side-head	53	2,018,994	61	1,184,319
Broaching machines:				
Horizontal	271	1,105,906	594	2,236,683
Vertical	134	733,780		
Cutting-off machines:				
Band saw	(1)	262,292	(1)	298,099
Hacksaw	1,418	590,267	2,018	906,357
Other (including cold saw)	60	141,197	223	518,781
Drilling machines:				
Vertical				
Sensitive (bench type)				
Single-spindle	12,027	535,735	24,689	1,172,956
Multiple-spindle	164	439,002		
Sensitive (except bench type)				
Single-spindle	1,152	368,394		
Multiple-spindle	457	854,882	779	1,497,584
Upright				
Single-spindle	693	904,759	593	943,077
Multiple-spindle	607	1,044,272	731	2,255,415
Way drills (vertical or horizontal)	95	1,050,991	86	1,277,892
Horizontal				
Single-spindle	64	131,595	(1)	1,189,730
Multiple-spindle	131	1,034,161		
Radial (plain and universal, including folding arm)	798	3,561,037	1,182	4,829,392
Automatic (station types)	34	280,585	(1)	4,089,507
Other (including drilling and tapping)	778	2,167,562		
Filing machines	306	56,453	673	118,276
Gear-chamfering, gear-tooth grinding, shaving, or burnishing machines	310	1,793,208	(2)	(2)
Gear-cutting machines:				
Hobbing machines	426	2,419,662	692	3,292,954
Formed rotary-cutter type (spur and bevel)	19	123,378	32	181,710
Generator and other	965	6,833,781	1,131	7,384,948
Grinding machines:				
Cylindrical—external, plain	1,132	7,012,433	1,155	8,186,546
Cylindrical—internal	1,028	7,372,073	1,004	5,864,445
Cutter and tool (includes lathe, planer, and tool grinders)	1,433	2,123,283	(2)	7,179,913[3]
Drill	975	808,115		
Disk, rotary or circular	434	517,673		
Universal	569	2,386,403	661	2,110,836
Surface				
Horizontal	2,132	3,217,620	2,037	2,896,836
Vertical	304	1,518,584	(2)	1,444,373
Tool or snagging (wet or dry, bench or pedestal)	(1)	276,563	5,824	493,634
Other	(1)	4,953,795	(3)	(3)
Keyseaters (except broaching)	402	81,389	(4)	(4)
Honing machines	357	1,358,571	147	692,299
Lapping machines	218	514,724		
Lathes:				
Bench (plain and screw-cutting)	15,167	2,288,434	14,663	1,911,181
Engine—General-utility				
16" swing and under	4,756	6,817,531	5,782	7,256,379
Over 16" swing and including 22"	1,072	3,382,159	1,142	3,212,983
Over 22" swing and including 36"	470	1,866,652	278	1,720,962
Heavy-duty, over 36" swing	125	1,133,033	27	376,851
Gap	134	364,297	32	141,907
Automatic single-spindle (horizontal or vertical)				
Bar (including screw machines)	1,071	3,908,951	1,896	6,313,866
Center type	324	1,720,627	(1)	704,944
Chucking	501	2,844,405	713	3,060,536
Automatic multiple-spindle (horizontal or vertical)				
Bar (including screw machines)	751	7,073,801	1,027	8,916,814
Chucking	230	3,061,409	371	4,720,165

For foot-notes see end of table on page 165.

Production of Machine Tools in 1939 and 1937 (Continued)

Compiled by the Bureau of the Census

Class	1939		1937*	
	Number	Value	Number	Value
Lathes (continued):				
Turret, horizontal hand-operated				
Ram type	1,937	7,467,835	2,168	6,654,278
Saddle type (standard and heavy-duty)	723	5,483,167	970	6,877,897
Polishing and buffing (bench and pedestal)	(1)	267,914	(1)	3,246,462
Other, including hand or speed	(1)	2,407,647		
Milling machines:				
Power-feed				
Automatic	602	2,104,471	445	1,186,475
Plain (including Lincoln type)	1,833	5,709,376	1,372	4,513,527
Universal	1,032	3,945,862	1,096	4,376,275
Vertical	1,437	5,872,911	931	4,141,625
Planer type	126	2,135,936	208	1,905,595
Other	301	3,236,012	588	3,119,186
Hand-feed	(1)	129,342	421	343,242
Planers:				
Standard (double housing)				
36" and under	21	186,627	(5)	(5)
Over 36"	50	1,215,679	40	658,686
Open-side	59	962,587	52	567,628
Other (including plate or scarfing machines)	22	996,806	44	330,136
Shapers:				
Horizontal				
20" stroke and under	851	956,671	513	870,765
Over 20" stroke and including 28"	221	578,065	253	619,003
Over 28" stroke	90	305,535	127	492,270
Threading machines:				
Other than pipe-threading				
Die type and rolling type	356	608,022	(1)	1,238,322
Milling type	206	1,086,877	154	851,547
Tapping machines	590	714,850	559	559,946
Pipe-cutting and threading machines				
Single-head and multiple-head, etc.	(1)	1,073,489	(1)	1,529,383
All other machine tools	—	8,226,140	—	7,505,260
Replacements and repair parts for machine tools	—	9,927,522	—	7,636,916
Rebuilt machine tools reported separately	—	4,791,679	—	—

*Revised. [1]Data incomplete. [2]Not called for on schedule. [3]Figure for cutter and tool, drill, and disk includes data for other grinding machines. [4]No comparable data. [5]Included with other.

Production of Machine Tools in 1939

THE Bureau of the Census, Washington, D. C., has just made public its compilation covering the machine tool and allied industries for 1939. The machine tool industry, as constituted for census purposes, includes establishments primarily engaged in the manufacture of power-driven metal-working machines, not portable by hand, having one or more tool- and work-holding devices and used for progressively removing metal in the form of chips. This definition also includes grinding, lapping, and honing machines.

In 1939, two hundred plants in this industry employed approximately 36,600 people and paid out $62,330,000 in wages. The value of the products of the industry amounted to $218,000,000. The table on this and the opposite page gives the details pertaining to different types of machine tools for 1939, and also gives comparable figures for 1937, the next previous year for which census figures were collected. The tables on pages 166 and 167 cover metal-working machinery other than machine tools, and accessories.

Sessions on Rubber and Plastics at A.S.M.E. Meeting

The increasing importance of rubber and plastics in mechanical engineering is emphasized by the fact that the sub-division on rubber and plastics of the American Society of Mechanical Engineers will have two sessions at the annual meeting of the Society to be held at the Hotel Astor, New York City, during the week beginning December 2. The subjects to be dealt with are the design and application of phenolic resin asbestos compositions in corrosion-resistant equipment; compression loading of rubber springs; the creep of natural and synthetic rubber compounds in shear; and the creep of Neoprene in shear.

Production of Metal-Working Machinery and Equipment

(Other than Machine Tools and Accessories)

Compiled by the Bureau of the Census

Class	1939		1937	
	Number	Value	Number	Value
Metal-working machinery and equipment (including replacement and repair parts), aggregate value	—	**$117,008,350**	—	**$141,776,796**
Bending machines:				
I-beam, pipe, plate, etc.	456	564,596	272	309,416
Sheet-metal brakes				
Number reported	1,515	1,211,513	2,457	1,166,625
Number not reported	—	195,157	—	—
Die-casting machines:				
Number reported	65	295,151	66	246,621
Number not reported	—	220,728	—	284,084
Forging machines (hammers, presses, etc.):				
Drop-hammers (impression die)	92	1,476,796	222[1]	1,740,263[1]
Forging hammers (flat die)	51	297,667	141	144,764
Forging presses	26	250,094	(1)	(1)
Other, including bulldozers and upsetters	—	1,566,967	—	2,045,748
Portable tools:				
Drills				
Electric				
Number reported	78,600	3,577,656	104,084	4,152,509
Number not reported	—	366,767	—	—
Pneumatic	41,947	5,906,601	35,035	5,601,252
Grinders				
Electric	21,359	780,878	31,402	1,374,959
Pneumatic				
Number reported	11,427	961,245	11,579	1,001,585
Number not reported	—	90,517	—	—
Hammers (chipping, riveting, calking, etc.)				
Electric				
Number reported	1,757	158,153	2,802	324,585
Number not reported	—	81,550	—	—
Pneumatic	20,442	1,115,510	17,139	978,764
Flexible-shaft machines				
Number reported	4,200	746,942	3,387	547,565
Number not reported	—	111,485	—	—
Cylinder reboring and finishing machines				
Valve and valve-seat grinders, and similar garage equipment	—	1,778,351	—	4,956,733
Other metal-working tools	—	1,303,307		
Presses:				
Forming	888	4,468,559	4,546	10,468,167
Stamping	3,370	8,501,071		
Punch				
Number reported	1,130	1,396,257	3,694	3,667,023
Number not reported	—	—	—	154,025
Other	—	1,258,042	—	746,941
Punching machines (not portable)	64	74,499	(2)	134,673
Riveting machines (not portable):				
Light-duty				
Number reported	499	336,190		
Number not reported	—	82,049	(2)	883,497
Heavy-duty	247	62,548		
Rod and wire forming and fabricating machines	—	1,404,290	—	2,090,862
Rolling-mill machinery and equipment	—	33,336,439	—	52,138,559
Shears (hand-lever and foot-power)	1,004	87,041	—	(3)
Shears (power):				
Alligator	94	106,890		
Combination punch and shear	34	103,283	465	776,483
Rotary	27	53,685		
Straight	588	1,375,978	594	1,229,652
Other power shears	—	97,007	—	839,674[3]
Sheet-metal-working machinery:				
Can forming and soldering	—	16,233,988	—	17,609,929
Other	—	956,191	—	1,422,705
Spring winding and forming machines	174	415,139	(4)	(4)
Welding and cutting apparatus, acetylene[5]	—	3,865,065	—	5,867,688
Wire-drawing machines	—	1,328,563	—	1,653,833
Other metal-working machinery and equipment	—	6,876,536	—	7,104,498
Replacement and repair parts	—	11,531,409	—	10,113,114

[1]Figures for forging presses included with those for drop-hammers.
[2]Data incomplete.
[3]Figures for hand-lever and foot-power shears included with "Other power shears."
[4]Not called for on questionnaire.
[5]Data for electric welding apparatus are classified in the electrical generating, distribution, and industrial apparatus industry and therefore are not included in this report.

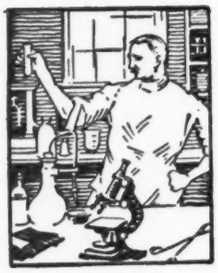
Production of Machine Tool Accessories in the United States

Compiled by the Bureau of the Census

Class	1939	1937
Machine tool and other metal-working machinery accessories, metal-cutting and shaping tools, and machinists' precision tools, aggregate value	**$163,453,221**	**$176,081,688**
Attachments and fixtures, total value	98,295,628	95,649,930
General equipment:		
Chucks, drill	1,374,445	1,688,279
Chucks, lathe	2,292,279	2,555,958
Chucks, magnetic	336,847	321,778
Vises (machine)	223,541	233,714
Attachments for machine tools:		
Boring machine	414,618	95,479
Drilling machine	471,536	440,084
Lathe (engine)	585,683	727,934
Milling machine	1,767,518	848,228
Other machine tool	1,612,102	549,744
Special equipment:		
Balancing machines	342,733	(1)
Die-casting dies	1,333,356	1,117,890
Jigs, fixtures, drop-forging dies, forming and stamping punches, dies, sub-presses, etc., and specially designed tools	76,515,745	69,354,174
Semi-finished products (die sets, leader pins, bushings, dowel-pins, die springs, jig bushings, etc.)	2,610,928	3,049,279
Tools for screw and automatic machines (box-tools, hollow mills, work- and tool-holders, etc., except taps and dies)	4,248,398	3,102,172
Model and experimental work	948,633	4,737,245
Other attachments and fixtures	3,217,266	6,827,972
Small cutting tools and tool-holders, total value	53,371,096	66,731,373
Arbors and collars	343,474	256,252
Broaches	2,730,877	(2)
Collets or sockets, etc. (lathe, milling machine, and drill)	1,161,506	738,475
Counterbores	330,006	1,058,200
Countersinks and combination countersinks and drills	854,435	542,891
Drills, carbon	2,483,603	2,986,130
Drills, high-speed	9,971,623	12,202,413
Gear-cutters, other than hobbing	2,350,752	2,317,867
Hobbing cutters, carbon	265,897	2,969,934
Hobbing cutters, high-speed	3,917,307	
Lathe, planer, and shaper tools (not including tool-holders)	1,476,934	975,640
Lathe, planer, and shaper, tungsten-carbide tipped	1,529,335	508,590
Milling cutters (all types), end-mills, slotting cutters, etc.:		
Solid		
Carbon steel	64,057	526,835
High-speed steel	5,338,023	8,989,344
Tungsten-carbide tipped	624,425	683,843
Inserted-teeth	911,263	849,911
Reamers (solid, expansion, and inserted-blade):		
Carbon	856,885	1,176,305
High-speed	2,836,048	3,885,766
Threading tools:		
Taps and dies (not pipe-threading)		
Taps, carbon (except collapsible)	2,067,367	2,721,898
Taps, high-speed (except collapsible)	3,155,610	5,048,972
Taps, collapsible	103,879	56,303
Dies, carbon (except self-opening)	697,106	1,271,258
Dies, high-speed (except self-opening)	151,092	397,989
Dies, self-opening	507,450	285,977
Chasers	2,470,237	2,539,011
Pipe-threading		
Taps (except collapsible)	220,830	433,580
Taps, collapsible	135,262	285,722
Dies (except self-opening)	602,596	848,576
Dies, self-opening	611,465	
Chasers	586,297	1,296,240
Pipe stocks complete with dies	1,540,778	1,825,142
All other cutting tools, tool-holders, mandrels, etc.	2,474,677	9,052,309
Precision measuring tools (micrometer and vernier)	2,321,709	1,581,165
Gages (plug, ring, snap, thread, etc.)	2,125,713	3,002,642
Other measuring tools	1,113,072	2,229,363
Miscellaneous equipment and accessories not called for above:		
Wheel-truing (diamond-point and other)	1,371,879	816,355
Other	4,854,124	6,070,860

[1]Value of balancing machines included in figure for "Other attachments and fixtures." [2]Not called for on questionnaire for 1937.

MATERIALS OF INDUSTRY



THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

New Material for Checking Impressions of Dies and for Making Patterns

A plasticized sulphur-carbon compound known as "Plasul Basolit" is being made by the Nukem Products Corporation, 70 Niagara St., Buffalo, N. Y. Among other purposes, this compound is particularly adapted for checking impressions of forging dies and die-casting dies, an application for which lead impressions have been employed heretofore.

The advantages claimed for the new material are that it is very light, its weight being only one-fifth that of lead, that it does not shrink, and that it will show the finest markings of the form or die. It can also be used advantageously in place of wood patterns, since it is not subject to shrinkage, swelling, or warping, and will not change under atmospheric conditions.....201

New Type of Austenitic Steel Plate Made Available

An austenitic, tough, non-magnetic steel containing 11 to 13 1/2 per cent manganese and 3 1/2 per cent nickel has been placed on the market by Joseph T. Ryerson & Son, Inc., under the name of "Manganal."

Because of its nickel content, Manganal plate can be welded without subsequent quenching, as there is no loss in toughness when it is cooled from the welding temperature. Considerable saving in weight can be gained by welding Manganal plates to castings, where wear resistance is needed. Welding rod of 18-8 stainless steel has been found to give very satisfactory results with Manganal. This nickel steel has the advantages of 11-14 per cent manganese steel in resistance to wear and surface work-hardening, and, in addition, does not require subsequent heat-treatment when formed or punched hot.

It has the following chemical composition: Carbon, 0.60 to 0.90 per cent; manganese, 11 to 13 1/2 per cent; silicon, 0.60 to 0.95 per cent; and nickel, 2 1/2 to 3 1/2 per cent. Its physical properties include a tensile strength of 140,000 to 150,000 pounds per square inch; an elastic limit of 55,000 to 60,000 pounds per square inch; an elongation in 2 inches of 72 1/2 per cent; and a reduction in area of 54 per cent.

It has already found use in electrical applications where non-magnetic characteristics are required, and also as a substitute for heavy castings where weight reduction is important. Typical applications include journal boxes, pedestal liners, wear plates, mill liners, shovel buckets, conveyors, and crusher hammers. It is available in 48- by 120-inch plates, in thicknesses of 3/16, 1/4, 3/8, 1/2, 5/8, 3/4, and 1 inch.....202

Steel for Cold-Heading Dies with Improved Qualities

For some years, the Jessop Steel Co., 605 Green St., Washington, Pa., has made a type of steel for cold-heading dies by a process which eliminates the porous center of the cast ingots and thus insures a sound steel capable of long tool life. This steel is suitable for either solid or open die cold-heading work. Recently methods have been introduced which have considerably improved the quality of this steel, these improvements insuring greater refinement in the structure, and better all-around performance in cold-heading operations. Being an electric furnace steel, the grain size can be carefully controlled, so as to permit a wide variation in hardening temperature without coarsening the grain. 203

Stripping Compound for All Types of Metal Finishes

The stripping of baked enamels, varnishes, lacquers, paints, japan, and the new synthetic finishes from various metals is now readily accomplished by means of a compound called "Metastrip," which is being marketed by the Surface Finishing Products Co., of New Haven, Conn. The compound is furnished in concentrated liquid form, and may be diluted for use with from one to three

To obtain additional information about materials described on this page, see lower part of page 172.

parts of water. It contains no caustics, but depends upon emulsifying action to float the finished coating away, leaving a bright clean metal surface. Usually about two minutes or less is required for the removal. When kept in the solution the removed coating breaks up into small particles which remain in suspension.....204

Transparent Protective Coating for Metal Surfaces

A new transparent coating material which dries almost immediately to a high lustre and has excellent qualities of adhesion, flexibility, and abrasion resistance has been introduced on the market by the Michigan Chrome Co., Detroit, Mich., under the name of Miccrolac. This coating provides excellent resistance to sulphur dioxide, sunlight, moisture, oil, grease, gasoline, and chemical fumes. It is accurately adjusted for viscosity and total solids to insure absolutely uniform results. No mixing with thinners is required. It may be applied by spraying or dipping, or if desired, it can be brushed on small parts.....205

Neoprene and Asbestos Used in the Production of Gaskets

A new type of gasket is manufactured by the Victor Mfg. & Gasket Co., Detroit, Mich., in which the desirable properties of asbestos and Neoprene are combined. These gaskets are made by a new process that results in an entirely different type of product from the usual rubber or Neoprene-asbestos composition commonly known as "superheat packing."

In the new process, the gaskets are first blanked from asbestos sheet material. They are then coated with a Neoprene cement, developed especially to resist the passage of gases and liquids. Two types of asbestos-Neoprene gaskets manufactured by this process are now available. One type has considerable compressibility and is adapted for joints where relatively light flange pressure is applied. Gaskets of this type are used where formerly treated paper, cork, or similar materials were applicable. The advantages of the new gaskets are permanency of size and ability to resist the effects of relatively high temperatures that would cause leaks with other materials.

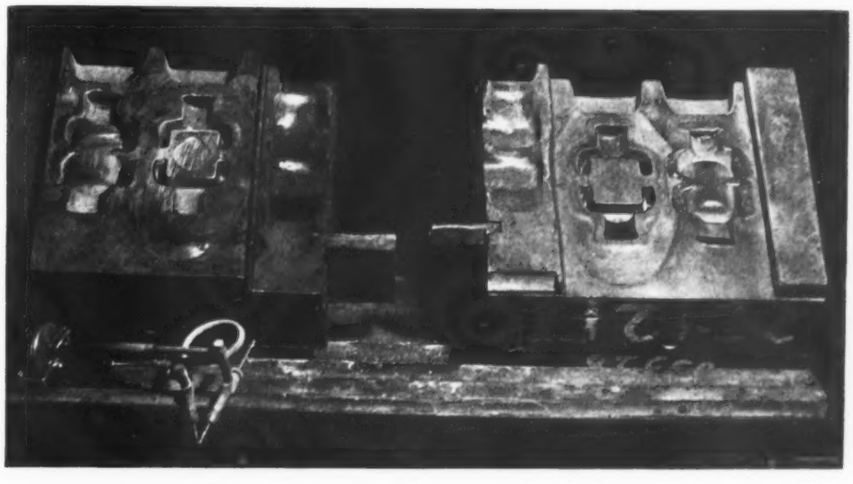
The second type of gasket is made for applications where heavier flange pressures are applied, as between machined surfaces. This type is being used successfully in places where higher cost gaskets were formerly employed, as well as in place of treated paper.

The possible applications for these gaskets are many and varied, though they are not expected to replace metallic asbestos gaskets. They should find wide application for sealing against oil, gasoline, or water in automobile and aviation engines, pipe joints, boiler equipment, etc.....206

Nickel-Chromium-Molybdenum Steel for Pile-Driving Equipment

Nickel-chromium-molybdenum steel meets the rigorous service requirements of ram pistons and cam rods of pile-driving machines, whose customary working operation is the striking of fast, heavy blows over an extended period of time. This steel has an excellent combination of strength and toughness at the high hardness that it develops with heat-treatment.

A typical analysis of the nickel-chromium-molybdenum steel used for ram pistons and cam rods is: Carbon, 0.35 per cent; manganese, 0.65 per cent; silicon, 0.10 per cent; nickel, 3.00 per cent; chromium, 0.75 per cent; and molybdenum, 0.35 per cent. After forging, the parts are normalized to relieve forging stresses, and rough-machined. They are then heated to a temperature of 1425 degrees F., oil-quenched, and drawn to the desired hardness.....207



Approximately 85 Per Cent of the Cost of a New Die was Saved by Rebuilding a Worn Drop-forging Die with a General Electric Atomic Hydrogen Welder in the Shop of the Die-Weld Co., Toledo, Ohio. All Worn Spots were Filled with Low-chromium High-carbon Steel of the Same Analysis as the Original Die

To obtain additional information about materials described on this page, see lower part of page 172.

NEW TRADE LITERATURE

Recent Publications on Machine Shop Equipment, Unit Parts and Materials. To Obtain Copies, Check on Form at Bottom of Page 171 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the November Number of MACHINERY

Welding Instructions

LINCOLN ELECTRIC CO., Cleveland, Ohio. Publication entitled "Lincoln Weldirectory," containing considerable helpful information for welders, covering procedures to follow in producing all types of welds in mild steel; in welding all metals used industrially; and in hard-surfacing. The data includes pointers on shielded arc welding and a guide for selecting electrodes. 1

Guides for Selecting Motors and Other Electrical Equipment

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. Small Motor Selector Guide (F. 8525), an illustrated folding sheet containing all essential data needed to fit the right motor type to any job. New edition of the Quick Selector catalogue for selecting the correct electrical equipment for any motor, lighting, or feeder circuit. 2

Material-Handling Equipment

INDUSTRIAL TRUCK STATISTICAL ASSOCIATION, 208 S. LaSalle St., Chicago, Ill. Material-handling handbook, intended to serve as a guide for the analysis of material-handling problems and operations and for the planning and operation of industrial-truck material-handling systems. Copies available to production executives and production engineers upon request. 3

Turret Lathes and Balancing Machines

GISHOLT MACHINE CO., 1209 E. Washington Ave., Madison, Wis. Performance Data Sheets Nos. 58 to 61, giving production data covering metal-turning operations on turret and automatic lathes, and static-dynamic balancing on a Dynetric balancing machine. 4

V-Belt Drives

PYOTT FOUNDRY & MACHINE CO., 328 N. Sangamon St., Chicago, Ill. Catalogue V-500, containing 112 pages on V-belt drive selection, making use of the revised V-belt ratings. The book contains "Economy Tables" which enable drive users to select readily the cheapest of the many drive arrangements that will do a given job. 5

Electrical Equipment

GENERAL ELECTRIC CO., Schenectady, N. Y. Circular GEA-1755C, on photo-electric relays; GEA-3436, entitled "Eight Ways You Can Use the Reactrol System for Temperature Control"; GEA-2165A, on the FK-142 oil circuit-breaker; GEA-2963B, on time switches for the control of alternating-current circuits. 6

Hobbing Machine Accessories

BARBER-COLMAN CO., 203 Loomis St., Rockford, Ill. Bulletin F-1410-1, illustrating and describing special units and accessories for the Barber-Colman No. 3 standard and No. 3 precision hobbing machines, designed to increase the efficiency of standard machines or adapt them to special classes of work. 7

Tool Steel

CRUCIBLE STEEL CO. OF AMERICA, 405 Lexington Ave., New York City. Booklet entitled "Tool Steel for the Non-Metallurgist," containing information on the characteristics of the different types of tool steel, the purposes for which various types are best adapted, and heat-treatment. 8

Roller Chain

MORSE CHAIN CO., DIVISION OF BORG-WARNER CORPORATION, Ithaca, N. Y., Bulletin R40, covering the construction of the roller chain made by this company, applications, suggestions for selecting the right chain for drives, performance data, and engineering information. 9

Industrial Cleaning Materials

MAGNUS CHEMICAL CO., INC., Garwood, N. J. Metal Working and Finishing Performance Data, comprising reports on the economies effected in actual service by the use of properly selected cleaning materials—a virtual handbook on metal cleaning and finishing. 10

Protective Creams

MILBURN CO., 905 Henry St., Detroit, Mich. Publication entitled "The Answer to Industrial Dermatitis," describing the various causes of industrial skin diseases and means of protecting workmen against them, including a list of creams and ointments for specific applications. 11

Lubricants

D. A. STUART OIL CO., LTD., 2727 S. Troy St., Chicago, Ill. Booklet describing various applications in actual service of a new industrial EP lubricant known as "Sturaco," suitable for high-speed heavy-duty machinery and equipment. 12

Forged-Steel Fittings

WATSON-STILLMAN CO., Roselle, N. J. Bulletin A3, covering the Watson-Stillman line of forged-steel fittings of the socket welding and screw end types. Includes data on the new 2000-pound screwed and socket welding fittings. 13

Vertical Automatics

TAVANNES MACHINES CO., Tavannes, Switzerland. (Agent in U. S., COSA OVERSEA TRADING CORPORATION, 5000 Chrysler Bldg., New York City.) Catalogue describing a new type "Gyromatic" six-spindle vertical automatic for bar or chuck work. 14

Nibbling Machines

A. C. CAMPBELL DIVISION, AMERICAN CHAIN & CABLE CO., INC., Bridgeport, Conn. Bulletin describing Campbell nibbling machines for cutting all kinds of shapes from sheet metal or composition sheets. 15

Hydraulic Lift Trucks

LEWIS-SHEPARD SALES CORPORATION, 295 Walnut St., Watertown,

Mass. Circular 10-202, descriptive of the new Lewis-Shepard hydraulic open-end lift-truck, designed especially for moving extra heavy machine tools. 16

Shell-Threading Machines

LANDIS MACHINE CO., INC., Waynesboro, Pa. Catalogue illustrating and describing the various types of die-heads and threading machines made by this company for performing threading operations on munitions. 17

Zinc Products

AMERICAN ZINC INSTITUTE, 60 E. 42nd St., New York City. Booklet entitled "The Zinc Industry," a descriptive outline of zinc from mine to market, dealing with production and consumption of zinc in this country. 18

Plastic Products

ROHM & HAAS CO., INC., 222 W. Washington Square, Philadelphia, Pa. Booklet covering the properties and more important applications of a crystal-clear plastic known as "Flexiglas," as well as Crystalite molding powder. 19

Equipment for Measuring Surface Roughness

PHYSICISTS RESEARCH CO., 343 S. Main St., Ann Arbor, Mich. Bulletin illustrating and describing the Profilometer (a machine for measuring surface roughness). 20

Grinding Wheels

NORTON CO., Worcester, Mass. Bulletin 571, entitled "Grinding Haynes-Stellite J-Metal and 2400 Cutting Tools," containing recommendations for the proper procedure and grinding wheels to use on this class of work. 21

Precision Gages

SHEFFIELD GAGE CORPORATION, 1526 E. Third St., Dayton, Ohio. Catalogue covering the design, construction, and application of precision gages, including standards and constants useful in inspection work. 22

Soft-Face Hammers

STANLEY TOOLS, New Britain, Conn. Circular containing data on a new line of soft-face hammers for use in the aircraft and automotive industries and on sheet-metal work in general. 23

Safety Shields

BOYER-CAMPBELL CO., 6540 Antoine St., Detroit, Mich. Circular entitled "Light Where You Want It Plus Protection," showing various applications of Marvel shields to industrial operations. 24

Broaching Equipment

COLONIAL BROACH CO., 147 Jos. Campau, Detroit, Mich. Bulletin VBS-40, covering the new line of "Senior" assembling, straightening, and broaching presses with capacities of 1 to 10 tons. 25

Precision Jig Borers

MEYER MECHANICAL LABORATORY, 1811 Sacramento St., San Francisco, Calif. Catalogue descriptive of the Autometric jig borer, a precision boring machine that is self-measuring and completely automatic. 26

Surface Grinders

BLANCHARD MACHINE CO., 64 State St., Cambridge, Mass. Catalogue 220, illustrating and describing the Blanchard No. 18 surface grinder and its application on various classes of work, including production data. 27

Nickel Steels

INTERNATIONAL NICKEL CO., INC., 67 Wall St., New York City. Bulletin containing information on the working of S A E nickel alloy steels, including machining, heat-treating, and welding. 28

Flexible Metal Hose

ECLIPSE AVIATION DIVISION OF BENDIX AVIATION CORPORATION, 545 N. Arlington Ave., East Orange, N. J. Circular on Eclipse seamless flexible metal hose for conveying non-solids and non-abrasives. 29

Endless Belts

MANHATTAN RUBBER MFG. DIVISION OF RAYBESTOS-MANHATTAN, INC., 34 Townsend St., Passaic, N. J. Drive data book on Condor whipcord endless belts, listing more than 1500 different drives available with these belts. 30

To Obtain Copies of New Trade Literature

listed on pages 170-172 (without charge or obligation), mark with X in the squares below, the publications wanted, using the identifying number at the end of each descriptive paragraph; detach and mail to:

MACHINERY, 148 Lafayette St., New York, N. Y.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48

Name ..... *Position or Title* .....

[This service is for those in charge of shop and engineering work in manufacturing plants.]

Firm .....

Business Address .....

City ..... *State* .....

[SEE OTHER SIDE]

Chip-Breaker Grinder

CARBOLOY COMPANY, INC., Detroit, Mich. Technical bulletin GT-121, covering the new chip-breaker grinder for cemented-carbide tools that are designed for the machining of steel. 31

Air-Hardening Die Steel

JESSOP STEEL CO., 605 Green St., Washington, Pa. Circular containing data on the properties of Jessop Windsor special air-hardening die steel. 32

Roller Bearings

S K F INDUSTRIES, INC., Philadelphia, Pa. Catalogue on S K F spherical roller bearings, showing applications and giving helpful information on bearing selection. 33

Kennametal-Tipped Tools

MCKENNA METALS CO., 147 Lloyd Ave., Latrobe, Pa. Chart No. 5, listing the horsepower requirements for cutting steel with Kennametal-tipped tools. 34

Clutches

CARLYLE JOHNSON MACHINE CO., Manchester, Conn. Catalogue on Johnson friction clutches; also bulletin Series No. 1, covering "Maxitorq" multiple-disk clutches. 35

Hardness Gage

R. A. WEBSTER, 422 Twentieth St., Santa Monica, Calif. Circular illustrating and describing a hardness gage of new design for rapidly testing the hardness of metals. 36

Lock-Nuts

SECURITY METAL PRODUCTS, INC., 359 E. Kalamazoo Ave., Kalamazoo, Mich. Bulletin describing the "Security" nut, a lock-nut incorporating a new locking principle. 37

Drafting-Room Supplies

HUNTER ELECTRO-COPYIST, INC., Syracuse, N. Y. Circular on Heccotex, a sensitized linen that enables rapid photo-tracings to be made from pencil drawings in ordinary office light. 38

Welding Equipment

PIER EQUIPMENT MFG. CO., Milton and Cross Sts., Benton Harbor, Mich. Folder containing condensed data on manually operated, as well as automatic types of spot-welding machines. 39

Automatic Molding Press

CROPP ENGINEERING DIVISION OF WARREN LAMP CO., Warren, Pa. Bulletin describing the features of the Cropp 12-ton completely automatic molding press. 40

Automatic Riveters

TOMKINS-JOHNSON CO., Jackson, Mich. Bulletin R-4, illustrating and describing the "Rivitor," a machine for automatically feeding and setting solid rivets. 41

Universal Lathe Chucks

WESTCOTT CHUCK CO., Oneida, N. Y. Bulletin 540-G, containing data on Westcott "Oneida" universal lathe chucks. 42

Roller Chains and Sprockets

WHITNEY CHAIN & MFG. CO., Hartford, Conn. Stock list V-150, listing Whitney roller chains and sprockets from stock. 43

Milling Machines

FRAY MACHINE TOOL CO., Glendale, Calif. Catalogue describing the outstanding features of the Fray "All Angle" milling machines. 44

"Chatterless" Countersinks

SEVERANCE TOOL MFG. CO., 1532 E. Genesee Ave., Saginaw, Mich. Bulletin 12-E, describing Severance "chatterless" countersinks. 45

Meehanite Dies

MEEHANITE RESEARCH INSTITUTE, 311 Ross St., Pittsburgh, Pa. Bulletin 11, entitled "Meehanite, the Metal for Cast-to-Form Dies." 46

Special Splined Shafts

SPENCER MFG. CO., Spencer, Ohio. Circular on "truss-grain" splined shafts, made to specifications. 47

"Unbrako" Screws

STANDARD PRESSED STEEL CO., Jenkintown, Pa. Catalogue 558, on "Unbrako" screws. 48

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described on pages 173-194 is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment mark with X in the squares below, the identifying number found at the end of each description on pages 173-194 — or write directly to the manufacturer, mentioning machine as described in November MACHINERY.

51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74		75
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99		100

Fill in your name and address on other side of this blank.

To Obtain Additional Information on Materials of Industry

To obtain additional information about any of the materials described on pages 168-169, mark with X in the squares below, the identifying number found at end of each description on pages 168-169 — or write directly to the manufacturer, mentioning name of materials as described in November MACHINERY.

201	202	203	204	205	206	207

Fill in your name and address on other side of this blank.

Detach and Mail to MACHINERY, 148 Lafayette St., New York, N. Y.

[SEE OTHER SIDE]

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Morey Heavy-Duty Shell-Manufacturing Lathe with Finger-Tip Control

A 27-inch, heavy-duty, manufacturing lathe designed for single-purpose operation at the maximum speeds and feeds possible with present-day cutting tools has been brought out by the Morey Machinery Co., Inc., 410 Broome St., New York City. Although designed especially for ordnance manufacture, this lathe can be employed for a variety of heavy-duty production machining operations.

It is assembled from a number of basic units, some of which can be interchanged to suit individual requirements. For example, the lathe can be equipped with a hexagonal turret unit, mounted on a separate saddle and provided with individual stops, or it can be furnished as shown in Figs. 1 and 2. A complete battery of these machines can be assembled with the proper combination of basic units and equipped for the manufacture of shells from the rough forging to the point where the shells are ready for thread-milling.

The outstanding features of this machine are finger-tip control; all anti-friction bearings; spindle speed set to suit each individual job; instant selection of the correct feed for the job; and heavy rigid construction designed to eliminate vibration.

The spindle is mounted in Timken bearings, front and rear, and has a bore 6 inches in diameter. The main drive herringbone gear is 22 inches in diameter, and is driven through spiral pick-off gears, twin disk clutch, and multiple V-belt from the motor. This entire drive, including the motor, is enclosed in the headstock and controlled at the carriage.

The hydraulic feeds are finger-tip controlled from the carriage apron. This arrangement permits the operator to remain in a convenient position for viewing the cutting tools during the entire machining operation. The controls are so interlocked that when the clutch lever is thrown out to stop the spindle, the feeding mechanism is automatically stopped and cannot be engaged again until the spindle is started.

The finger-tip controlled carriage can be supplied in five different combinations adapted for handling a great variety of work. No manual effort is required to operate the tailstock, which can be traversed in either direction under finger-tip control of a single lever. 51

Universal Thermo-Couple Fitting

To facilitate thermo-couple replacement, a universal union for angle type couples has been developed by the Leeds & Northrup Co., 4921 Stenton Ave., Philadelphia, Pa. The two halves of this union fit snugly together in a ground joint, making it vapor- and fume-tight. The hot leg of the thermo-couple can be detached or rotated to any angle between 90 and 180 degrees and locked firmly in place. 52

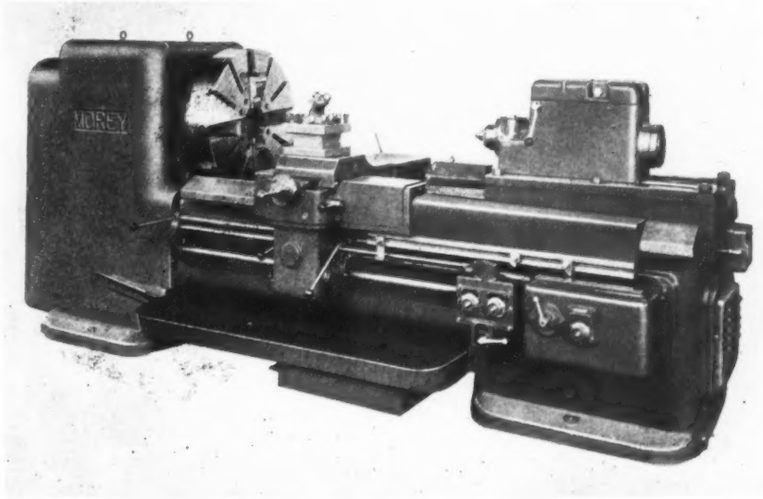


Fig. 1. Morey Shell-manufacturing Lathe with Finger-tip Control

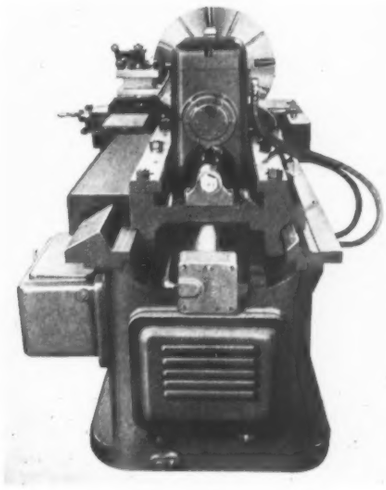


Fig. 2. End View of Morey Lathe

To obtain additional information on equipment described on this page, see lower part of page 172.

"Tocco Junior" Hardening Machine

A new Type MG 10 "Tocco Junior" machine has been developed by the Ohio Crankshaft Co., Cleveland, Ohio, for the localized surface hardening of small parts by electrical induction. This machine can be used for brazing, soldering, annealing, heating for forming, and similar operations, as well as for surface hardening.

The built-in motor-generator set supplies a high-frequency current of 9600 cycles at 220 to 440 volts to the inductor block. The design follows closely that of the larger Tocco machines, except that all parts are incorporated in a single unit. Full-automatic timing controls, specially designed water-cooled transformers, and easily changed work-fixtures are some of the features of this machine. The complete compact unit can be fitted readily into a production line, thus eliminating handling between the machining line and the heat-treating department.

Although designed primarily for handling small parts, the new type machines can also be used for hardening medium-sized parts, such as small gasoline engine crankshafts, drill chuck bodies, etc. Each part is locally hardened at the wearing surface only, and comes from the inductor free from dirt, scale, decarburization, and distortion. The hardening time on suitable ferrous materials is but a few seconds, the depth of hardness being easily governed. The high hardness blends gradually into the core, thus preventing flaking or spalling, the original ductility of the core remaining unchanged.

The five new Junior models, with output capacities ranging from 10 to 80 kilowatts, are completely self-contained units and are built with from one to three hardening stations. All models have the same over-all dimensions, each occupying a floor space of about 5 feet by 6 feet 8 inches. 53

Moslo Hopper Feeding Machine for Welding Rod

A machine for feeding welding rod from a hopper that was originally designed and built for one of the large welding-rod manufacturers has just been placed on the market by Moslo Machinery, Inc., 5005 Euclid Ave., Cleveland, Ohio. This feeder is designed primarily for passing straightened and cut wires or rods into an extrusion press for the application of coating material to the welding rods.

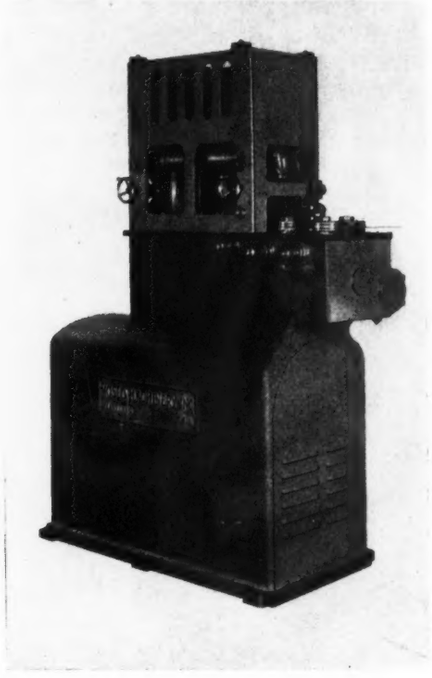
The hopper is built entirely of steel plates, and has a capacity for about 500 pounds of wire rod material. The guide plates of the feeding mechanism are arranged so that adjustment is obtained from a single hand-screw. With this adjustment, it is possible to feed the smallest, as well as the largest, rods without interruption due to misalignment.

The speed is controlled through an adjustable Reeves drive to permit matching the feeding speed of an extrusion press or any other machine with which the equipment is used. The feeder rolls are located in a vertical plane, while the support shafts for the material are in a horizontal plane. The feeder is supplied in three hopper sizes that take wires 18, 24, and 36 inches in length. Each machine is capable of handling any length rod up to its maximum capacity. 54

Improved Hand and Power Feed Milling Machines

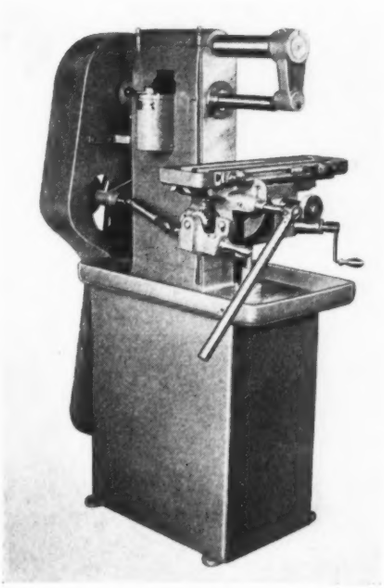
An improved V-belt drive, hand and power feed milling machine, with reversing switch and motor in the base, has been brought out by Miller & Crowningshield, Greenfield, Mass., to meet the requirements for production milling. A rack feed is provided for rapid operation. A ½-H.P. motor is standard equipment, but

"Tocco Junior" Self-contained Hardening Unit Available in Five Models with Output Capacities from 10 to 80 Kilowatts



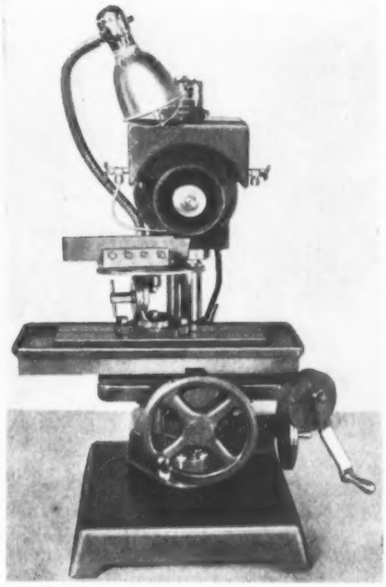
Moslo Feeding Machine that Feeds Welding Rods from Hopper to Extrusion Press for Coating

To obtain additional information on equipment described on this page, see lower part of page 172.



Improved Milling Machine Brought out by Miller & Crowningshield

Toledo Double-action Toggle Press of 650-ton Capacity



Carboloy Chip-breaker Grinder for Cemented-carbide Tools

other types of motors may be substituted. A 3/4- or 1-H.P. motor is recommended for high-speed work.

V-pulleys for the motor and jackshaft that can be interchanged, the same as gears on a lathe, give twelve speeds of from 180 to 3200 R.P.M. By using four extra-length V-belts, thirty-six speeds are obtainable.

The spindle has a No. 10 B&S taper with a 3/4-inch hole. The table is 6 1/2 by 22 1/2 inches. It has a longitudinal traverse of 14 1/2 inches and a cross-feed of 3 1/4 inches, with a micrometer dial. The knee has a vertical travel of 9 inches, with a dial adjustment. The machine requires a floor space of 18 by 21 inches, and weighs 700 pounds. 55

Cutting Oil for High-Speed Operations

A newly developed cutting oil to be used on difficult, high-speed operations, such as on stainless steels and high-strength alloy steels for aircraft use, has been placed on the market by the Quaker Chemical Products Corporation, Conshohocken, Pa., under the trade name "Quaker Kut No. 141." This is a combination of fatty waxes, sulphur, and fat and mineral oils. The cutting compound is furnished ready for use, but can be diluted with 100-inch viscosity paraffin oil for the usual run of work. The compound is said to give an excellent finish, increase tool life, and permit speeds and feeds to be materially increased in many cases. ... 56

Toledo Toggle Drawing Press

The Toledo Machine and Tool Division of the E. W. Bliss Co., 1420 Hastings St., Toledo, Ohio, is introducing to the trade a new line of heavy-duty toggle drawing presses. The No. 2-E-10-86 straight-sided, double-action press of this line is shown in the accompanying illustration. This press is of four-piece, steel tie-rod construction with shrunk-in tie-rods and castings of high-alloy semi-steel having great strength and hardness.

All gearing, eccentrics, etc., are enclosed in the crown of the press. The covers that protect the bearings and working mechanisms are easily removable. A cascade filtered-oil system is employed. An exceptionally long adjustment is available for high and low dies. The lower motion of the press illustrated is independently driven and electrically synchronized with the upper motion.

Other features of this machine include triple gearing, V-belt motor drive, hydraulic friction clutch with disk brake, electric push-button control, hydraulically operated brake for stopping the flywheel after the power has been turned off, and a slide that is counterbalanced by air cylinders.

The bed area is 62 inches front to back by 86 inches right to left. The plunger slide has a capacity of 650 tons. The distance from bed to slide, with stroke down and adjustment up, is 75 inches. 57

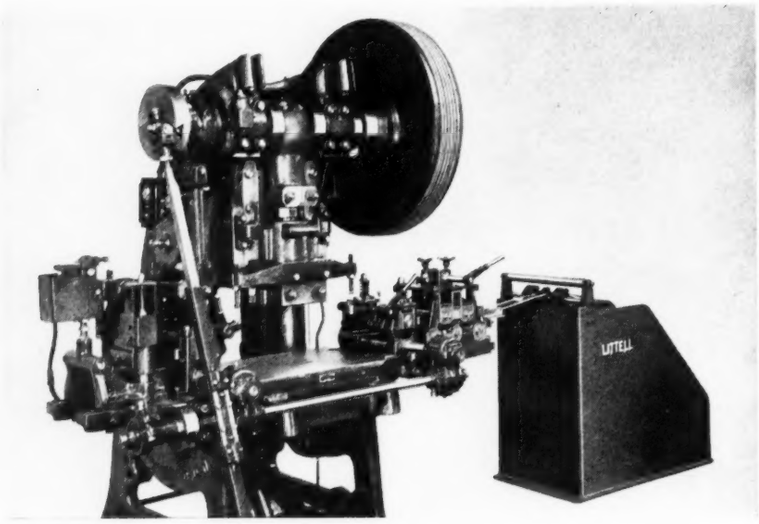
Carboloy Chip-Breaker Grinder

To meet the chip-breaking problem occasioned by the increasing use of cemented carbides for steel cutting, the Carboloy Company, Inc., Detroit, Mich., has brought out the chip-breaker grinder shown in the accompanying illustration. In most steel-machining operations with cemented-carbide tools, chip-breakers of some form are essential to clear the chips from the work and to provide for the operator's safety, especially in cases where chips come from the work at speeds of 400 feet or more per minute.

The exact forms of the grooves or chip-breakers determined as ideal for any given operation can be quickly duplicated with the new Carboloy grinder. With this grinder, the tool is clamped in a holder on the universally adjustable fixture table, which is fitted with three protractors. A resinoid diamond wheel of 100 grit is recommended.

In grinding the chip-breaker, the wheel is fed down while the table travels back and forth. The wheel feed is provided with graduations, so that chip-breakers can be ground to the exact depth desired. The grinder is designed to accommodate tools up to 1 1/4 inches in width. The 1/4-H.P. motor, which runs at 3450 R.P.M., is equipped with a reversing switch and operates on 110-volt, 60-cycle, alternating current. Special motors for 220 volts and 25 or 50 cycles are available. 58

To obtain additional information on equipment described on this page, see lower part of page 172.



Littell Scrap-cutter, Designed to Cut at Any Predetermined Number of Strokes of the Punch Press

Littell Intermittent Scrap-Cutter

A scrap-cutter of the intermittent type for use on punch presses has recently been placed on the market by the F. J. Littell Machine Co., 4149 Ravenswood Ave., Chicago, Ill. This cutter is so designed that scrap or finished material can be cut at any predetermined number of strokes of the punch press. The blades are normally held in their open or operating position by springs. A gag or blocker unit is built into the rear scrap-cutter connection, the gag being connected and operated by a solenoid switch. When this switch is energized, it moves the gag to the blocking or cutting position.

The solenoid is connected electrically to the controlling unit which consists of a ratchet, a driving mechanism for operating the ratchet, and a switch operated by trip-lugs placed at predetermined points on the ratchet gear. In operation, the lugs are placed on the ratchet gear to trip the switch at any number of press strokes desired. For example, if it is desired to cut off a strip of metal at every twenty strokes of the press, a 60-tooth ratchet is selected and three trip-lugs attached at equidistant points on the ratchet. The cutter can be set to cut off the strip after any predetermined number of strokes, from two to sixty, by using either the 60-tooth or a 48-tooth ratchet furnished with the equipment. 59

Gyromatic Vertical Automatic Screw-Cutting Machine

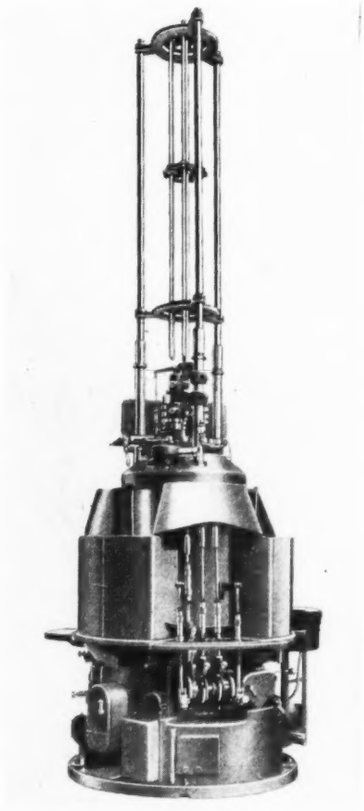
Gyromatic automatic screw-cutting machines with vertical instead of horizontal spindles, designed by a Swiss engineer, Otto Schaerer, and built by the Tavannes Machines Co., Tavannes, Switzerland, are being placed on the market in this country by the Cosa Oversea Trading Corporation, Chrysler Building, New York City. Reduction in floor space and the feeding of bar stock by its own weight are advantages obtained by arranging the spindles vertically. This arrangement also results in quieter operation, as the bars, being in a vertical position and guided in tubes, remain straight and, therefore, have little hammering action. Danger of the operator being caught by the revolving bars is avoided.

These machines are ordinarily built with six spindles. The six vertical slides for turning tools and the six cross-slides for facing tools are operated by cams which are so located around the base that the tools can be easily adjusted to hold the length and the diameter measurements to size within limits of 0.001 inch while the machine is running. The length slides and cross-slides have simple toolposts which accommodate tools such as are ordinarily used on engine lathes and turret lathes. The six drilling, tapping, and reaming spindles, operating below and opposite the work-spindles, are fed upward. This allows the chips to drop out of the holes, an important advantage in deep-hole drilling.

The whole weight of the spindle drum and the bar stock is carried on a ball-thrust bearing. The spindle drum is indexed intermittently one-sixth of a revolution to bring the six spindles to the different tooling stations, the indexing being on a diameter twice as large as the pitch diameter of the spindle head. No chips, cutting oil, dust, or dirt can fall on the spindle head, which is located above the cutting tools. These machines are built in capacities for bars 1, 1⅝, and 2½ inches in diameter. They are also made in three capacities for chucking work 4, 5 1/2, and 7 1/2 inches in diameter. 60

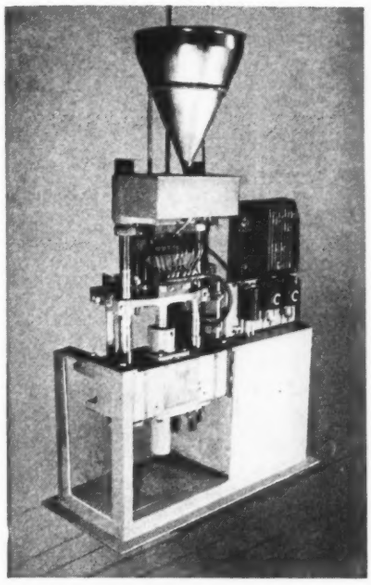
Cropp 12-Ton Automatic Molding Press

A self-contained molding machine for thermo-setting materials, especially designed to handle compression molding powders of phenol and urea formaldehyde or phenol-furfural, has been brought out by the Cropp Engineering Division of the Warren Lamp Co., Warren, Pa. This is a completely automatic machine. Once



Gyromatic Vertical Automatic with Six Up-feeding Spindles, Six Length-slides and Six Cross-slides

To obtain additional information on equipment described on this page, see lower part of page 172.



Cropp Self-contained Automatic Molding Machine

the operations have been timed, the press repeats each operation to a split second, making perfect moldings hour after hour with practically no attention. A sensitive weighing device detects any imperfect moldings, stops the machine automatically, and rings for the foreman.

The molding powder is fed from a large hopper by a solenoid-operated measuring and feeding device. A "Microflex" controls the curing period to a split second, and can be adapted for any time periods up to twenty minutes. Each circuit of the time-sequence device is adjustable while the press is in operation. This device times the periods allowed for measuring the molding powder; loading; closing and opening the molds; stopping the opening movement; cleaning out the mold with an air blast; and weighing the molded piece. The timer is connected to the motor by spur gears. Jog push-buttons for the opening and closing movements facilitate mounting the molds in the machine.

Molding pressures up to 12 tons are available under finger-tip control. The machine is driven by a 220-volt, 60-cycle, three-phase, 5-H.P. motor. The machine is 52¾ inches long, 22¾ inches wide, and 76 inches high, including the hopper. The mold plates are 6 by 9 inches. The stroke is 6½ inches, and the maximum vertical opening 10 inches. The maximum size of molding that can be produced is 2½ inches high by 8 inches long by 5 inches wide. The maximum projected area is 13 square inches. 61

Buffalo Drilling Machines

The Buffalo Forge Co., Buffalo, N. Y., has brought out two new drilling machines, the "RPMster" shown in Fig. 1 and the motor-spindle drilling machine shown in Fig. 2.

The "RPMster" is equipped with V-belt drive; six-spline, alloy-steel spindle; positive-drive, all-geared, semi-automatic feed; and alloy-steel back-gears. It is built in two sizes —the No. 3 having a capacity for drilling holes 1½ inches in diameter in cast iron, and the No. 2 with a rated capacity of 1 inch. The overhang capacity of both machines is 13 inches. Accessibility of controls, and the complete enclosure of the motor, starter, speed-change mechanism, coolant system, and electrical wiring are features of these machines. They can be furnished with or without back-gears, and with or without power feed.

These machines are available in pedestal models with any number of spindles up to six. Back-gears can be employed to give a reduction of 4 to 1, thus increasing the range of the variable-speed V-belt drive. These machines can be equipped with one of three types of tapping devices —a friction type tapping attachment, a motor reverse control operated by a small lever switch, or an automatic reverse-feed handle control. Any commercial make friction type attachment can be adapted to this machine.

The range of spindle speeds for the No. 2 machine is from 175 to 3000 R.P.M., and for the No. 3 machine, 350 to 2000 R.P.M. Two feed ranges are available for each machine, the ranges for the No. 2 being 0.003 to 0.006 and 0.009 to 0.012, and for the No. 3 machine, 0.006 to 0.009 and 0.015 to 0.019 inch. The spindle of the No. 2 machine has a No. 3 Morse taper, and the spindle of the No. 3 machine has a No. 4 Morse taper. The No. 2 machine requires a floor space of 50 by 27 inches and weighs 1875 pounds, while the No. 3 machine requires about the same floor space and weighs 1950 pounds.

The motor-spindle drilling machine is also made in two sizes—No. 2 and No. 3. The No. 2 is made with 8- and 13-inch overhangs, while the No. 3 is made only with a 13-inch overhang. Pedestal models only are available, with from one to six spindles. The No. 3 machine is driven by a 3-H.P. motor, and the No. 2 machine by a 2-H.P. motor. The No. 3 machine has a rated capacity for drilling 1½-inch holes in cast iron, while the No. 2 has a capacity for drilling 1-inch holes in cast iron.

These machines can be furnished with or without back-gears, with or

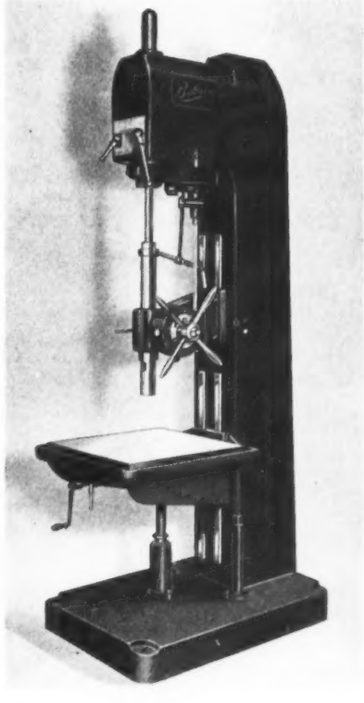


Fig. 1. Buffalo "RPMster" Drilling Machine

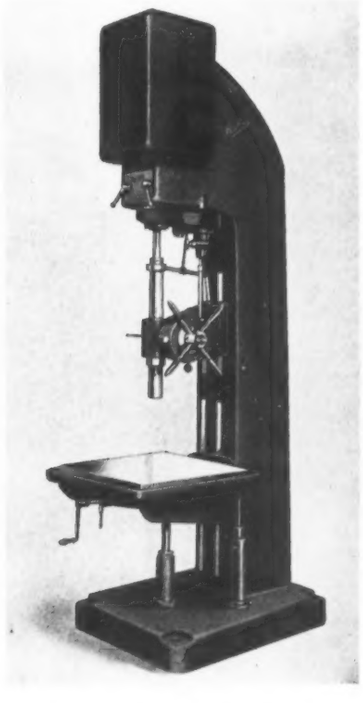


Fig. 2. Buffalo Motor-spindle Drilling Machine

To obtain additional information on equipment described on this page, see lower part of page 172.

without power feed, and with or without motor reverse for tapping. They can also be equipped with three types of tapping devices, the same as the drilling machine shown in Fig. 1. The maximum distance from the spindle nose to the table is 27 inches for both the No. 2 and No. 3 machines. The sliding head has an adjustment of 8 inches, and the spindle nose has an adjustment of 14 inches. The spindle has a travel of 6 inches.

The working surface of the table of the No. 2 machine is 18 by 14 inches, and of the No. 3 machine 23 by 22 inches. The weight of the No. 2 machine, with single spindle, is 1900 pounds, and with six spindles, 7700 pounds. The single-spindle No. 3 machine weighs 2000 pounds, and the six-spindle machine 8000 pounds. 62

Fixture for Checking Hobs

A new hob-checking fixture designed for the routine checking of hobs after sharpening has been developed by the Michigan Tool Co., Detroit, Mich. The fixture is adapted for checking radial sharpening, spacing of flutes, and run-out. It can also be used for checking single form relieved cutters, or for checking form gashing cutters for sharpening and spacing.

The fixture has a maximum capacity of 15 inches between centers, and will handle hobs or cutters up to 12 inches in diameter. The dial indicator can be moved in both horizontal and vertical planes, while the hub that carries the indicator can be moved parallel to the centers for checking at either end of a long hob.

The up and down movement of the indicator is obtained by means of a micrometer barrel having a graduated dial. The over-all dimensions of the fixture are 38 by 25 by 20 inches, and the shipping weight is 450 pounds. An indexing plate, a 1¼-by 6-inch arbor, and one indicator are furnished with each fixture. 63

Hisey Grinder Equipped with New Wheel Guards

The Hisey-Wolf Machine Co., 2800 Colerain Ave., Cincinnati, Ohio, has recently brought out 5- and 7½-H.P. pedestal type grinders equipped as shown. These machines are built in 18- and 20-inch wheel sizes. The motors are totally enclosed and ventilated through the large pedestal. A continuous circulation of air passes through the motor and out of one motor foot into the pedestal, then into the other motor foot and again through the motor.

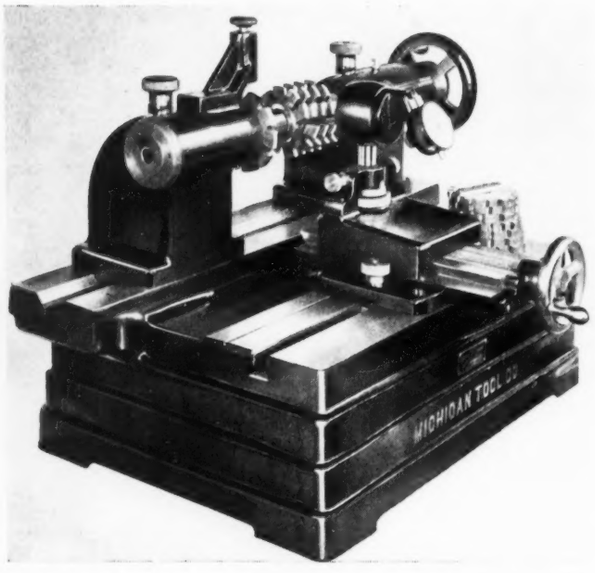
The machines can be supplied with new guards as shown, which are designed in accordance with the standards adopted by the American Foundrymen's Association. With these guards, it is impossible for a piece of work to become jammed between the wheel and the guard, and the guard extends beyond the periphery of the wheel a sufficient distance to arrest all sparks and chips. The flange and the outlet at the rear of the guard can be easily connected to the dust collecting system. 64

Delta Surface Plate with Ribbed Back

Delta Surface Plates

The Delta Mfg. Co., 612 E. Vienna Ave., Milwaukee, Wis., has placed on the market two new surface plates developed to meet the needs of shop men who require accurate, convenient surface plates for lay-out work. The two new surface plates—measuring 15 by 8 by 3 inches, and 16 by 22 by 3 inches—are designed to meet all the requirements for the class of work for which they are intended, and are obtainable at a fraction of the cost of hand-scraped precision plates. They provide a true surface and are of massive design.

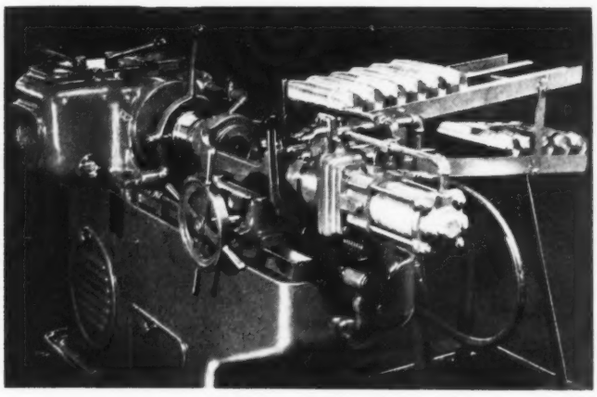
The ledges at the edges of the plate are provided for clamping purposes. The outer edges of the plate are square with each other and also square with the face. These plates can be converted into precision type plates by simply scraping them to a master plate or to each other. 65



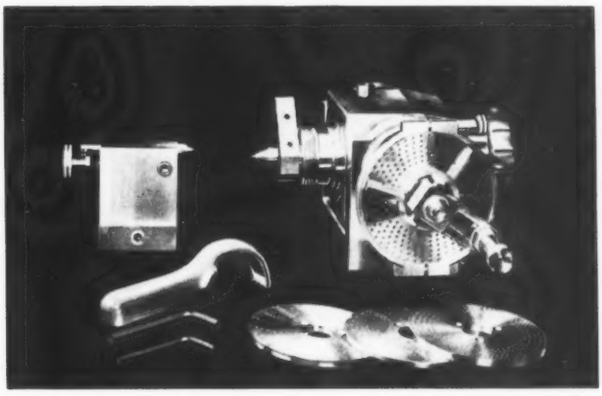
Hob-checking Fixture Developed by Michigan Tool Co.

Hisey Grinder Built in 18- and 20-inch Wheel Sizes

To obtain additional information on equipment described on this page, see lower part of page 172.



Shell Tapping Machine Brought out by Landis Machine Co.



Hardinge Precision Index-centers for Milling Machines

Landmaco Shell Tapping Machine

The Landis Machine Co., Inc., Waynesboro, Pa., is now building a Landmaco machine designed especially for tapping the nose end of shells ranging in size from 75 to 155 millimeters. This machine has all the mechanical features of the regular Landmaco threading machine, as well as new features developed to assure accurate tapping operations at a high production rate. The machine shown is equipped to handle the 75-millimeter shell, although a special arrangement is available which permits handling all sizes from 75 to 155 millimeters on one machine and with one attachment.

The special carriage or holding device comprises a work supporting cradle, a hardened and ground bushing which supports the nose end of the work and a female center which supports the base end. The center is actuated by an air cylinder at the rear of the carriage and is controlled by a lever. In operation, the center is employed to push the work forward until it is seated firmly in the ground bushing that supports the nose end. This provides a locking action which holds the work rigidly in alignment for tapping.

The spindle is equipped with a collapsible tap designed especially for this work. The tap has internal ducts through which the cutting coolant is conveyed directly to the cutting edges of the chasers. A special feature is the tripping collar which also functions as a pilot to assure the maintenance of close tolerances for alignment of the thread with the body of the work. The collapsing mechanism of the tap is actuated by the tripping collar when it strikes the end of the work. Danger of the chaser striking the shoulder at the bottom of the work and thus causing breakage is eliminated by this arrangement. Production is estimated to average 90 to 115 shells per hour. 66

Hardinge Precision Index-Centers

Hardinge Brothers, Inc., Elmira, N. Y., have brought out new index-centers for use with their precision tool-room milling machine. The spindle is mounted in super-precision loaded ball bearings. The threaded nose of the spindle is 2 3/16 inches in diameter, and has ten threads per inch. Spindle-nose attachments and collets can be interchanged on Hardinge precision lathes of similar capacity. The spindle section swings through an angle of 220 degrees, and is graduated for settings from 10 degrees below the horizontal to 20 degrees beyond the vertical position. A vernier, graduated in minutes, is provided for fine settings.

The spindle is ground to take standard 5C Hardinge collets, which have a capacity for holding round stock from 1/16 to 1 inch, hexagonal stock up to 7/8 inch, or square stock up to 23/32 inch.

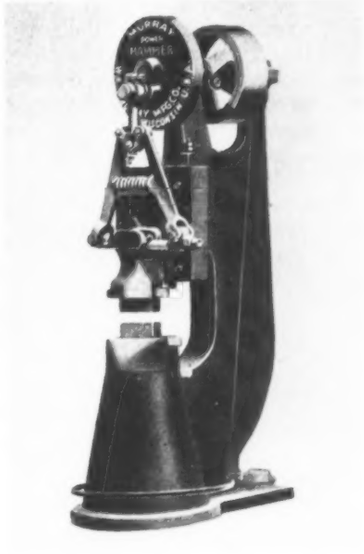
Spiral bevel gears provide a 4-to-1 ratio between the spindle and the index-plate crank. This provides a speed ten times faster than that of the usual 40-to-1 ratio.

Four index-plates are furnished, together with a chart showing all the divisions obtainable from 2 to 360. The index-plate mounting is independent of the gearing, and the spindle and crank are engaged between the two by means of the clamp on the outer periphery of the index-plate. With this arrangement, work can be chucked and located as desired, and the index-plate adjusted accordingly. Adjustable positioning stops permit angular settings to be repeated, as is frequently required in chucking duplicate work when the spindle is set on a vertical or nearly vertical plane.

The index-head is arranged for right-hand mounting. It will swing work 7 inches in diameter. The total length of the index-head and tailstock combined is 14¾ inches. A similar index-head is available for spiral milling, which covers all leads from 0.600 to 42.656 inches. 67

Murray Power-Driven Hammers

The D. J. Murray Mfg. Co., Wausau, Wis., is now building power-driven hammers of improved design in five sizes ranging from 25 to 500



Murray Power-driven Hammer

To obtain additional information on equipment described on this page, see lower part of page 172.

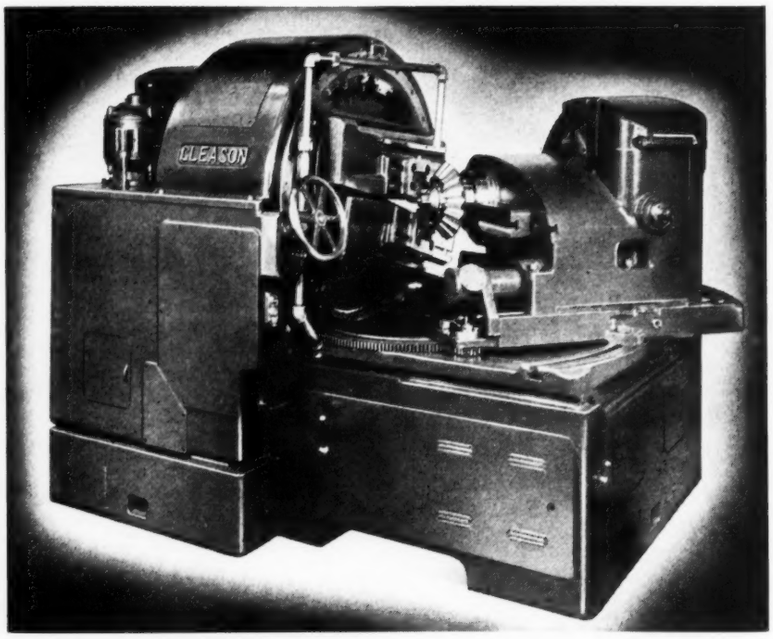
pounds. These machines cover a range of capacities for general forging of round stock from 2 to 7 inches in diameter. The range for handling flats edgewise without adjustments is from 2½ up to 8 inches wide. The size of the upper die face for the smallest machine is 3 by 2 inches, and for the largest 10 by 5 inches. These machines cover maximum stroke capacities ranging from 7 to 21 inches, with throat depths from 9¼ to 18 inches.

The distance between guide and anvil block in the smallest machine is 4¼ inches, and in the largest 15 inches. The smallest machine is operated at a speed of 425 R.P.M., while the largest machine is operated at a speed of 170 R.P.M. The floor space required for the smallest machine is 16 by 26 inches, and for the largest machine 36 by 60 inches. A motor of 1 H.P., operating at a speed of 1200 R.P.M., is recommended for the smallest machine, while a 7½-H.P. motor having a speed of 720 R.P.M. is recommended for the largest machine. 68

Westinghouse Multi-Speed Across-the-Line Magnetic Starters

A new across-the-line magnetic starter for use with multi-speed squirrel-cage motors of from 220 to 600 volts, 1 to 100 H.P., has been placed on the market by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. It is designed to start the motor across the line at any speed. Different speeds are obtained by changing the connections to the motor in such a manner as to change its number of poles, the method commonly employed on machine tools, fans, mixers, conveyors, etc. The new starter is available for the following types of multi-speed motors of two-, three-, or four-speed types: Constant-horsepower, constant- and variable-torque, and single- and double-wound motors.

The features include push-button speed selection, accurate overload and low-voltage protection, De-Ion arc quenchers, and front-of-board wiring, with accessible terminals. Optional features include selective speed control, compelled slow-speed starting, and automatic-sequence acceleration and deceleration. All sizes are supplied with standard or dust-tight sheet-steel enclosures. Small sizes are available in enclosures for Class 2 Group G and Class 1 Group D hazardous locations. 69



Gleason Bevel Gear Generator for Rough- and Finish-cutting Teeth up to 1 1/2 Diametral Pitch

Gleason Straight Bevel Gear Generator

A new machine for rough- and finish-cutting the teeth of straight bevel gears has been developed by the Gleason Works, 1000 University Ave., Rochester, N. Y. This machine, designated the No. 24, will handle straight bevel gears up to 35 1/2 inches in diameter with teeth as coarse as 1 1/2 diametral pitch. It has been designed to make possible the cutting of smoother and quieter-running straight bevel gears of the larger sizes at an increase in production rates of from 30 to 50 per cent.

The tooth generating action is based on the principle of the relative rolling motion between the reciprocating tools and the gear blank, the same as that used on the well-known Gleason 12-inch straight bevel gear generator. A new type tool relieving mechanism and new tool-slides are employed which provide rigid tool support and permit higher stroke speeds than were previously possible on machines of this size. The tool-slide ways of cast iron, sliding against hardened steel, insure low up-keep cost for this important member.

The enclosed cradle is mounted on anti-friction bearings in a rigid housing. The cradle reverse and index mechanisms are cushioned to obtain fast, smooth, and quiet operation. The heavy work-head is secured to a large base which slides on a heavy, one-piece frame. The feeding motion for the tooth depth and the withdrawal motion for indexing are applied to the sliding base through a cam and adjustable lever. The cam has a double track, one track for rough-cutting and the other for finish-cutting. A hydraulically operated in-and-out movement is a feature that provides rapid operation of the work-head to and from the chucking position.

The work-spindle is bored to a nominal diameter of 6 inches at the large end, and has a 3/4 inch taper per foot. This facilitates chucking large-shank work and permits faster cutting because of the increased rigidity. A new type of universal stock dividing gage accommodates all pitches within the machine range, and can be used for both even and odd numbers of teeth.

The maximum cone distance is 17 3/4 inches; the maximum pitch angle 84 degrees 18 minutes; and the minimum pitch angle 5 degrees 42 minutes. The pitch diameter ratios range from 1 to 1 up to 10 to 1. The maximum pitch capacity for cutting 10 to 1 ratio bevel gears is 35 1/2 inches; for 2 to 1 ratio, 31 3/4 inches; and for 1 to 1 ratio 25 inches. Gears with face widths up to 6 inches can be cut. The indexing length of the machine provides for cutting gears with any number of teeth from 10 to 200. The floor space occupied by the machine is 74 by 105 inches. 70

To obtain additional information on equipment described on this page, see lower part of page 172.

Barber-Colman Standard and Precision Hobbing Machines

The No. 3 standard and precision hobbing machines now being built by the Barber-Colman Co., 203 Loomis St., Rockford, Ill., are available with a wide variety of new special units and accessories. The main points of difference between the standard and the precision machines are the extra large single-thread precision worm-gear on the precision machine, and the extremely close limits of accuracy to which the parts of this machine are held for the purpose of producing highly accurate work. All new special units and accessories can be applied to either machine.

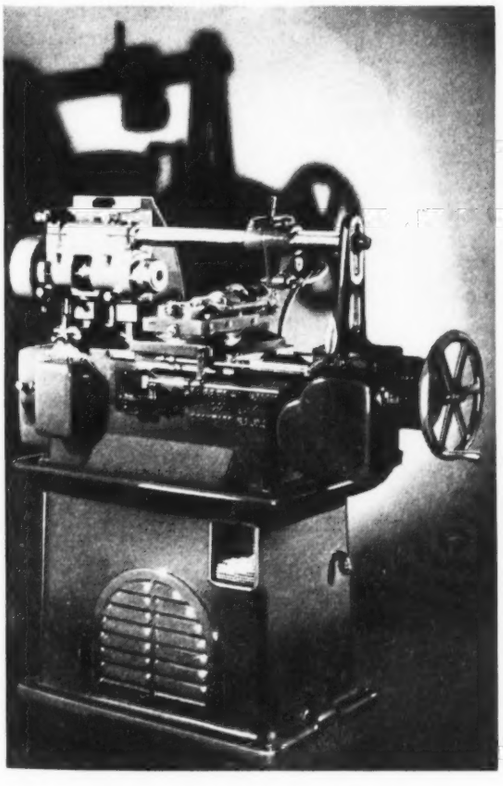
Both machines have a capacity for hobbing gears 5 inches in diameter and 12 diametral pitch, with 7-inch faces, in cast iron or steel. They are designed for general-purpose or production hobbing work, the precision machine also being adaptable to fine tool-room work. The precision machine is guaranteed to hold work within an accumulative error of not more than 0.0006 inch between non-adjacent teeth on a 4-inch pitch circle.

Special units and accessories applicable to these machines include vertical feed for cutting worms and worm-gears; horizontal cam feed for such work as hobbing speedometer gears where the cut is short; hand-wheel-operated collet adapted for small-lot work where it is necessary to change work frequently; lever-operated collet adapted for high-production work; special hob swivel for work of too high an angle for the standard swivel, such as high-angle helical gears, worms, and threads; left-hand hob swivel for hobbing right-hand helical gears with angles ranging between 30 and 60 degrees; micrometer adjustment which shows the operator at a glance exactly the distance the slide is being moved; one-shot oiling system for manually lubricating all important bearings of the machine at one time; taper hob spindle with run-out error averaging only 0.0001 to 0.0002 inch, designed to obtain extra fine finish, accuracy, and longer hob life; and high-speed hob swivel for fine-pitch class of work and small-diameter work, especially on brass and aluminum, which usually requires smaller hobs than the minimum size made for the standard 3/4-inch spindle. 71

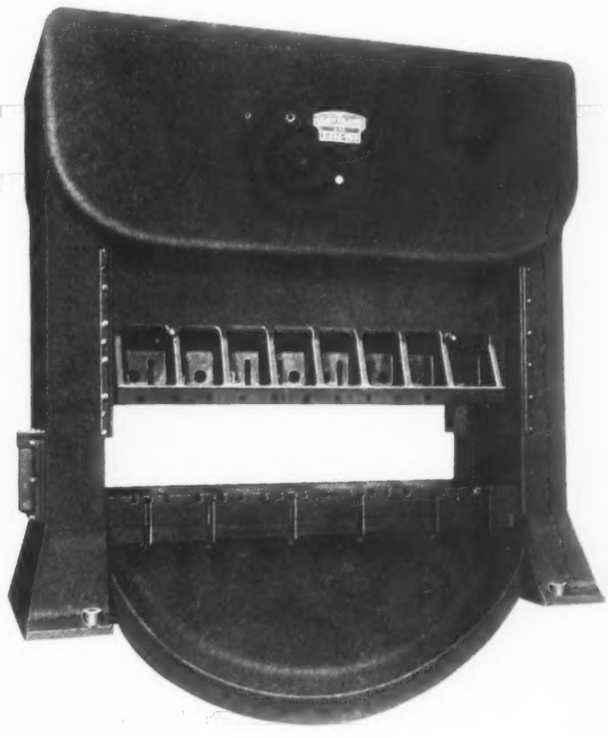
Cleveland Two-Point Press

A two-point press measuring 156 inches between uprights and having an over-all height of 260 inches, is a recent design of the Cleveland Punch & Shear Works Co., Cleveland, Ohio. The press is symmetrical front and back, the double gearing and drive unit being located in the box type crown. It is equipped with a pneumatically operated friction clutch and brake, and the flywheel is provided with an air brake which brings it to a quick stop when the power is shut off. The slide is counterbalanced by air, the cylinders being located in the uprights and easily removable without disturbing other members of the press.

The bed, which measures 52 inches front to back and 156 inches right to left, is equipped with a T-slotted bolster plate and pneumatic cushions. The slide has a stroke of 12 inches, and the press operates at a speed of nine strokes per minute. All gears run in oil, and all bearings are lubricated by an automatic power-operated pump. 72

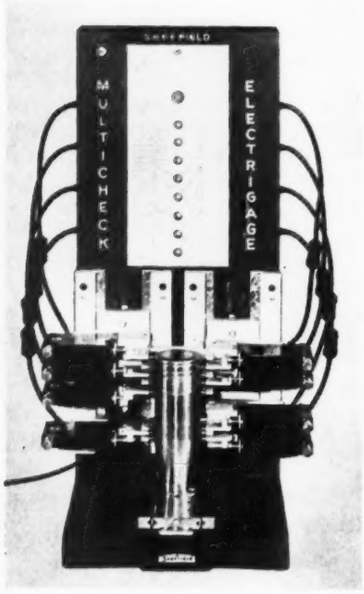


Barber-Colman Hobbing Machine Available with a Variety of Special Units and Accessories



Two-point Press Equipped with Pneumatically Operated Clutch, Built by the Cleveland Punch & Shear Works Co.

To obtain additional information on equipment described on this page, see lower part of page 172.



"Multicheck Electrigage" Developed for the Rapid Inspection of Shells

Sheffield "Multicheck Electrigage"

The Sheffield Gage Corporation, Dayton, Ohio, has recently brought out a precision instrument for the rapid inspection of mass-production parts having several critical dimensions, as, for instance, the different diameters and shoulder lengths of an armature shaft. This gage, known as the "Multicheck Electrigage," is being used for the inspection of timing fuse elements, shell bodies, cartridge cases, and miscellaneous army ordnance work.

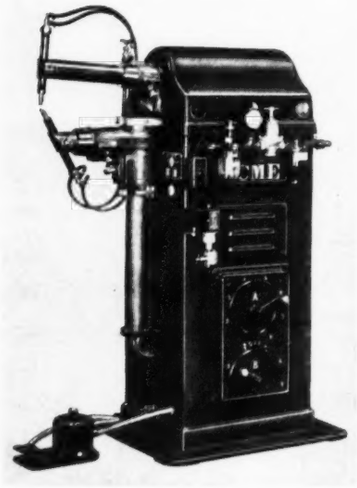
Measurements of length, diameter, and depth are flashed simultaneously on a control board by means of colored signal lights when the work is placed in the gaging position. An individual gaging head is provided for each dimension checked, and each head actuates a signal light. When one of the signal lights shows amber, the diameter being gaged is within the required tolerance; when the light shows red, the diameter is under size; and when green, over size.

In addition to the individual signal lights, there is a master signal light which shows white when all dimensions pass inspection. When this light shows red, the individual signal lights are observed to determine which dimension is incorrect. An outline or plan of the work is arranged as shown in the illustration, so that the inspector can locate each dimension and its indicating light at a glance.

It is claimed by one user that an operator can check seven dimensions on a 75-millimeter shell at the rate of 600 shells per hour without eyestrain. These instruments can be used on parts of any size. Pinions less than 1/8 inch in length and less than 3/32 inch in diameter can be checked with this machine. 73

Acme Air-Operated Spot-Welders

A complete line of air-operated rocker-arm type spot-welders in transformer capacities of from 10 to 75 K.V.A., has been introduced to the trade by the Acme Electric Welder Co., 5621 Pacific Blvd., Huntington Park, Calif. The advantages claimed for the air-operating feature of these welders are faster production, more uniform spot-welds, and reduction in fatigue of the operator.



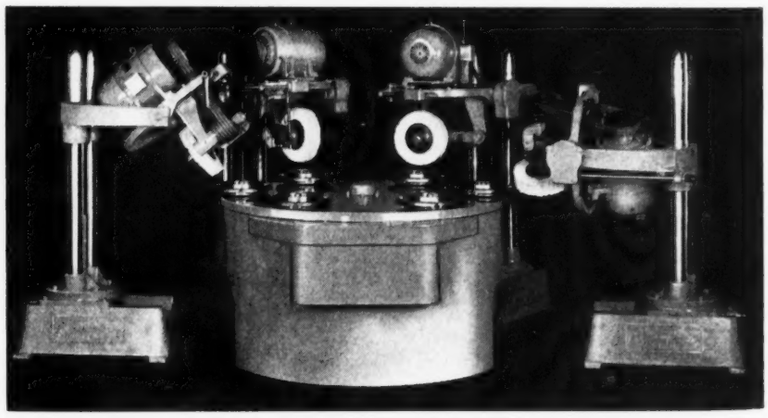
Air-operated Spot-welders Made by Acme Electric Welder Co.

These spot-welders are completely equipped with automatic weld timers and welder service magnetic contactors. They are offered in various styles, actuated either by a foot valve and limit switch, a solenoid-operated mushroom type floor switch, or a specially designed two-stage toe-operated floor switch, and are available for either single spot, non-beat, or automatic repeat operation. Heat regulation from 6 to 48 points is available. 74

Murray-Way Automatic Polishing Equipment

Buffing heads that can be quickly adjusted to any wheel position for successive production finishing operations, and can be used in combination with dial type indexing or continuous-rotation dial machines, as shown in the illustration, or with continuous straight-line conveyors, have been brought out by the Murray-Way Corporation, 253 Vinewood Ave., Detroit, Mich. The entire drive is mounted on a turntable which has a full 360-degree movement. The turntable and ring assembly swivel as a unit in the yoke member, and have a full 360-degree adjustment in the opposite plane. With this arrangement, the wheel can be moved to any desired position, there being no "blind" spots.

Besides the rotating adjustments, the entire buffing head assembly can be moved up and down on the two columns, which, in turn, have a swivel and lateral adjustment in the base. All these adjustments can be made quickly by means of crank-handles. The buffing spindle is full floating and has adequate means for taking up wheel wear and maintaining a predetermined work pressure. The dial table has a constant index-



Murray-Way Polishing and Buffing Equipment with Indexing Dial Table

To obtain additional information on equipment described on this page, see lower part of page 172.

ing time period, but the time of the dwell can be varied over a wide range through electric controls. The timing device is graduated in seconds and minutes. All indexing mechanisms and fixture drives are completely enclosed and operate in a bath of oil. 75

Webster Hardness Gage

A hardness gage operated by hand pressure, which enables the hardness of metal sheets and tubes to be easily and rapidly checked either before or after assembly, has been placed on the market by R. A. Webster, 422 Twentieth St., Santa Monica, Calif. This gage is approved by the U. S. Army and U. S. Navy for use in checking the condition of aluminum and aluminum alloys used in aircraft construction, and it is now being used by leading aircraft builders. Although the gage is used mainly for aluminum and its alloys, it can be applied to other metals, except those of extreme hardness.

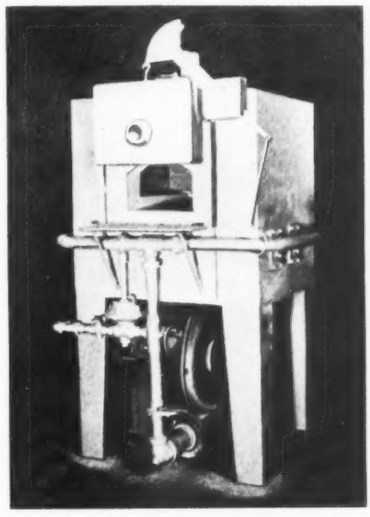
The instrument can be employed as a "Go" and "No Go" gage for checking the hardness of metals, the relative hardness being indicated by the number of impressions made by a penetrator having four teeth, each tooth being of a different length. The deeper penetration of the teeth on the softer metal results in more impressions, while the shallower penetration on harder metals results in fewer impressions. The load spring can be adjusted to show the desired number of impressions on a metal of known hardness.

The work to be checked is placed between the round anvil and the penetrator, as shown in the illustration. Sufficient pressure is then applied to the handles to cause the flat face of the penetrator housing to recede into the housing against the pressure of the load spring. Excess pressure on the handles does not affect the reading. 76

Mahr Tool Heat-Treating Furnace

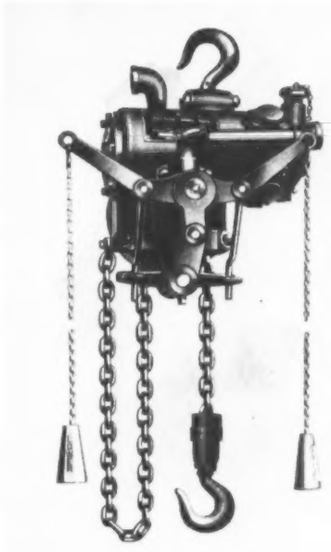
The Mahr Mfg. Co. Division of Diamond Iron Works, Inc., Minneapolis, Minn., has developed a gas under-fired, tool heat-treating furnace equipped with four premixed gas burners arranged for single-valve control. The furnace is 12 by 18 by 6 inches in size. The combustion chamber has been designed to give uniform heat throughout the hearth area at the temperature desired for any treatment of various classes of steel.

The improved control is designed to assure positive results that can be repeated by the operator. The special proportional air-gas mixer has a vernier control, graduated for easy and quick setting. The vernier control, in combination with charts showing the settings and temperatures for specific treatments of various classes of steel, enables the operator to make the required settings for any desired heat-treatment. 77



Mahr Improved Furnace for Heat-treating Tools

Webster Gage for Checking Hardness of Metal



Air-Bloc Hoist Made by the Ingersoll-Rand Co.

Ingersoll-Rand Air-Bloc Hoist

For hoisting light loads up to 700 pounds, the Ingersoll-Rand Co., 11 Broadway, New York City, has brought out the Air-Bloc hoist shown in the illustration. It is a flexible welded link-chain type air hoist designed for use in machine shops, maintenance shops, shipping and receiving departments, on assembly lines, and for general light lifting jobs. It is available in three sizes for handling loads of 300, 500, and 700 pounds.

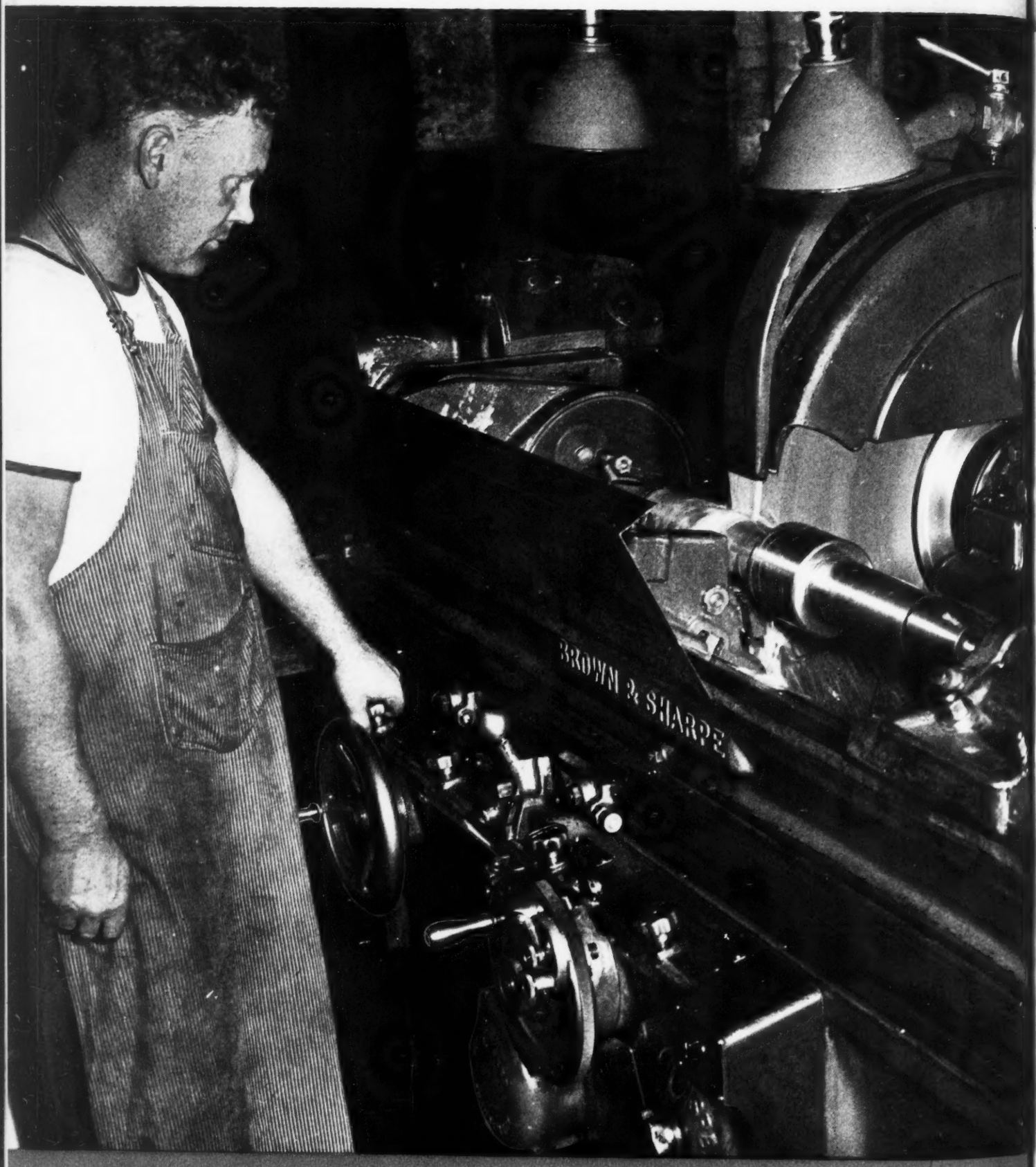
The Air-Bloc weighs less than 75 pounds, and can be easily moved from one job to another. An automatic up and down stop control prevents damage to the hoist from overrunning of the chain in either direction. Another safety feature prevents the load from dropping even if the air supply fails. The four-cylinder radial type air motor that operates this hoist cannot be damaged by overloading. The throttle control is sensitive and permits accurate "spotting" of the load. 78

G-E 300-Ampere Welders

The General Electric Co., Schenectady, N. Y., has added a new 300-ampere size to its line of arc-welding transformers with built-in power-factor correction. As in the 500-ampere welder previously announced, this new size has been designed to provide all the advantages of high power-factor without sacrifice of sta-

To obtain additional information on equipment described on this page, see lower part of page 172.

BROWN & SHARPE ELECTRICAL CONTROL



BROWN &

—FLEXIBLE OPERATION FOR FASTER GRINDING

Another Pioneering Achievement in *Electrical Control* by Brown & Sharpe — the 20 Series Plain Grinding Machines.

Outstandingly productive due to —

- -- SIMPLIFIED CONTROLS – once set for a production job, machine may be controlled entirely by the cross feed handwheel.
- -- FULL RANGE of SPEEDS – headstock, table movements and cross feeds.
- -- SHORTENED SET-UP TIME
- -- UNUSUAL EASE and CONVENIENCE of OPERATION
- -- SMOOTH QUIET ACTION
- -- DEPENDABILITY and LONG-LIVED PRECISION
- -- FLEXIBILITY – permitting use of new, ingenious, time and effort-saving features.

B·S

All operating controls are grouped within easy reach from the operating position, as shown at the left — a material contribution toward trouble-free precision grinding.

Ask for complete details of Electrical Control on Brown & Sharpe Milling, Grinding and Screw Machines. Brown & Sharpe Mfg. Co., Providence, R. I., U.S.A.

SHARPE

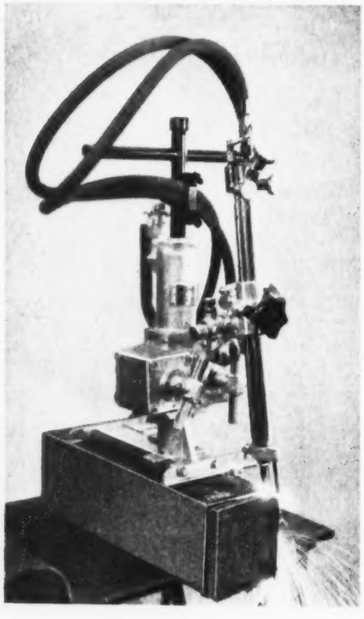
bility or performance. Smaller line cable, line switches, or fuses can thus be used, making savings on installation costs possible or enabling more welders to be added to existing feeders without causing overloads.

Other advantages include finger-tip current adjustment, large, easily read current indicators, protected output terminals, and fan-forced ventilation. This new welder has a height of 43 inches, a diameter of 21 inches, weighs 450 pounds and is similar in appearance to the 500-ampere welder illustrated on page 173 of October MACHINERY. 79

Linde Oxy-Acetylene Bar-Cutting Machine

A new oxy-acetylene cutting machine designed especially for cutting-off operations on round and square bars was exhibited by The Linde Air Products Co., Unit of Union Carbide and Carbon Corporation, 30 E. 42nd St., New York City, at the recent National Metal Exposition in Cleveland. This new equipment, known as the Oxweld CM-35 bar-cutting machine, will cut round or square bars with a minimum of adjustment, and is driven by a self-contained spring-power unit, the speed of which is hydraulically controlled to give an almost infinite variation of blowpipe cutting speeds ranging from 1 to 75 inches per minute.

The cutting machine can be used indoors or out, wherever oxygen and acetylene are available, and can be moved to a new working place at a moment's notice. This machine, with standard equipment, has a cutting range of from 2 to 10 inches. The cutting range can be changed, however, to from 8 to 15 inches by means of special linkage arms. 80



Bar-cutting Machine with Spring-power Unit for Traversing Blowpipe

Hammond Variable-Speed Polishing and Buffing Lathe

Hammond Machinery Builders, Inc., 1619 Douglas Ave., Kalamazoo, Mich., have recently added a Model VRO variable-speed machine to their line of Kalamazoo polishing and buffing lathes. This machine, which was exhibited at the recent National Metal Show in Cleveland, has an overhanging spindle, the front section overhanging the lower front of the base 12½ inches. This overhang is especially desirable when handling large bulky pieces.

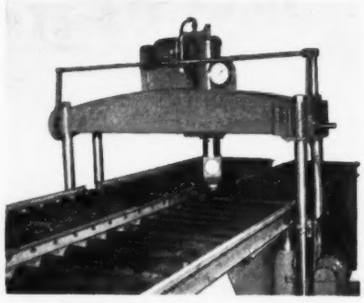
Polishing Lathe with Speed Range from 1500 to 30,000 R.P.M.

Speeds ranging from 1500 to 30,000 R.P.M. can be obtained by merely turning the handwheel at the front of the machine. An indicator shows the speed at which the lathe is running. 81

Brinell Hardness Tester for Wide Plates

The Detroit Testing Machine Co., 9390 Grinnell Ave., Detroit, Mich., has recently brought out a Brinell hardness tester designed for testing wide plates at any point without removing them from the conveyor. This equipment consists of a flat-base and cross-rail assembly supported by four posts.

The test cylinder is mounted on a carriage that slides between the rails and is moved across the plate by a small motor, operated by push-button control. The work conveyor runs between the posts, and the travel of the test-ram is sufficient to bring the ram in contact with the work by merely moving the operating lever. This long-stroke feature is identical to that in other machines manufactured by the company, and is available in standard units having strokes up to 24 inches. This equipment can be furnished to suit practically any distance between posts.



Conveyor System with Hardness Testing Equipment

A heavy work-support rail, running between the conveyor rollers, is located slightly below the rollers when idle. When a test is being made, the rail is brought into contact with the bottom side of the plate by a lever. In operation, the plate is passed over the rollers to the desired position and held in place by the work-support rail while tests are made across its width. The plate is then released and moved forward, after which the testing operation is repeated. This machine is available either as a plain power Brinell tester or with the company's direct-reading equipment. 82

Gaertner Bore Inspection Telescope

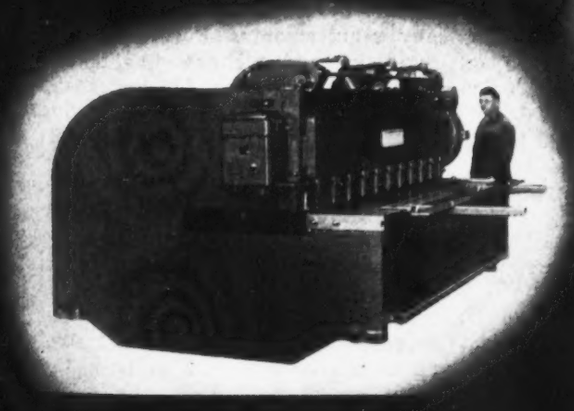
A bore inspection telescope which provides a clear and much enlarged detailed view of the inner walls of gun barrels, tubing, pipes, boiler tubes, and many other practically inaccessible recesses has been developed by the Gaertner Scientific Corporation, 1201 Wrightwood Ave., Chicago, Ill. Small holes, cracks, pits, scratches, and other defects are readily seen with this instrument. It can be used to inspect holes or bores from 1 to 4 inches in diameter. Extensions are available which permit inspection of holes to a depth of 20 feet 6 inches. 83

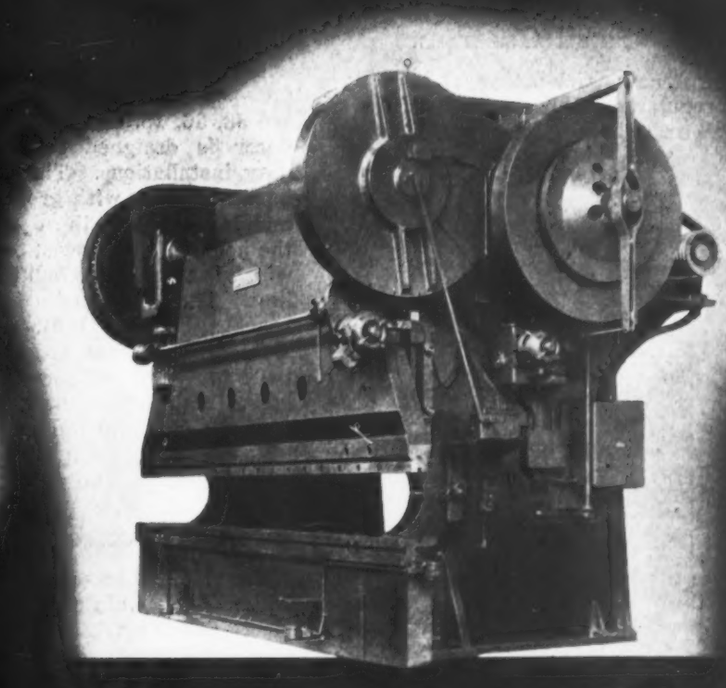
To obtain additional information on equipment described on this page, see lower part of page 172.

ARMOR PLATE

. . . Shear it on Cincinnati Shears
. . . Straighten it on Cincinnati Brakes

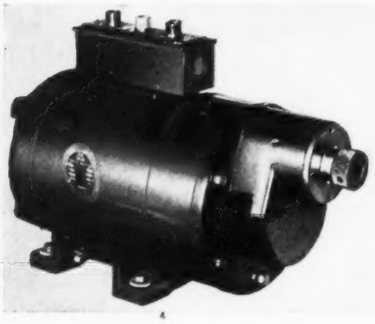
Write for recommendations based on our twenty years' experience in building Cincinnati Steel Press Brakes and Cincinnati All-Steel Shears for arsenals, navy yards, and manufacturers of armament.





THE CINCINNATI SHAPER COMPANY, CINCINNATI, OHIO

SHAPERS · SHEARS · BRAKES



Two-speed Geared Motor with Push-button Control

Walker-Turner Two-Speed Geared Motor

Two-speed, shock-proof geared motors with a double winding and an interlocking switch are being placed on the market by the Walker-Turner Co., Inc., South Ave. at Berchman St., Plainfield, N. J. The speeds can be changed instantly by the pressure of a button. These new motors are of special interest to designing engineers and manufacturers of equipment such as polishing and buffing machines that require means for changing speed instantly. They are available in various speeds from 700 to 8000 R.P.M., and in sizes from ¼ to 3 H.P. for polyphase circuits only. 84

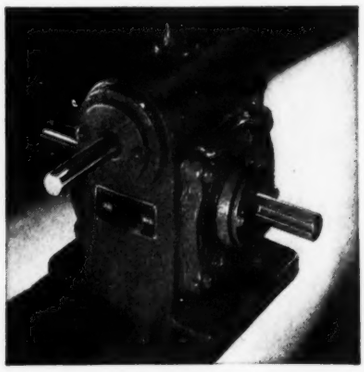
Voltage Regulator for Small Generators

A new quick-acting, rheostat type regulator has been developed by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., for the automatic voltage control of small alternating-current and direct-current generators. This regulator, known as the Silverstat Junior, is available in direct-current ratings up to 25 K.W., and in alternating-current ratings up to 45 K.V.A. It is designed to perform continuously and automatically the same operation obtained by hand manipulation of the field rheostat. 85

Westinghouse Voltage Regulator for Small Generators

Fractional-Horsepower Speed Reducer

Winfield H. Smith, Inc., Springville, Erie County, N. Y., has recently brought out a No. 3 1/2 BT speed reducer having a rating of 1/4 H.P., with a torque capacity of 140 to 190 inch-pounds. The ratios available are 58, 36, 18, and 9 to 1. This reducer is designed for continuous-duty installations. The worm is of hardened steel, with ground threads, and is located in the upper part of the housing. It is keyed to the shaft, which is mounted on ball thrust bearings. The gear is of a special alloy bearing bronze. Built-in type oil seals are provided at all shaft extensions. The reducer is 6 1/2 inches high, has a base 4 1/8 inches wide by 5 inches long, and weighs 15 pounds. 86

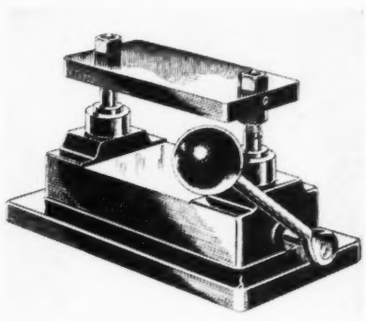


Speed Reducer Brought out by Winfield H. Smith, Inc.

Mohr Universal Drill Vise

The Mohr Line-Saw Co., 126 N. Union Ave., Chicago, Ill., has just placed on the market a universal drill vise designed to effect savings in time, as well as in tooling and drill-fixture costs. A slight pull on a ball-handled lever locks the work securely in place, while a pull on the lever in the opposite direction serves to release the work. By using different drill bushing plates and adapters, the vise can be employed for a wide variety of drilling operations. On long runs, or in cases where re-runs of the same part occur with considerable frequency, the vise can be used as a base for a permanent fixture, and the bushing plate and adapter can be fastened permanently in place.

The universal drill vise is 9 inches long by 5 inches wide over the base, and weighs approximately 14½ pounds. The bushing plate is 6½ by 3 inches, and is furnished as regular equipment. Extra plates to meet various requirements are available. Clamping pressure is maintained at a 40-to-1 ratio. 87



Universal Drill Vise Built by the Mohr Line-Saw Co.

Cutler-Hammer "Unitrol"

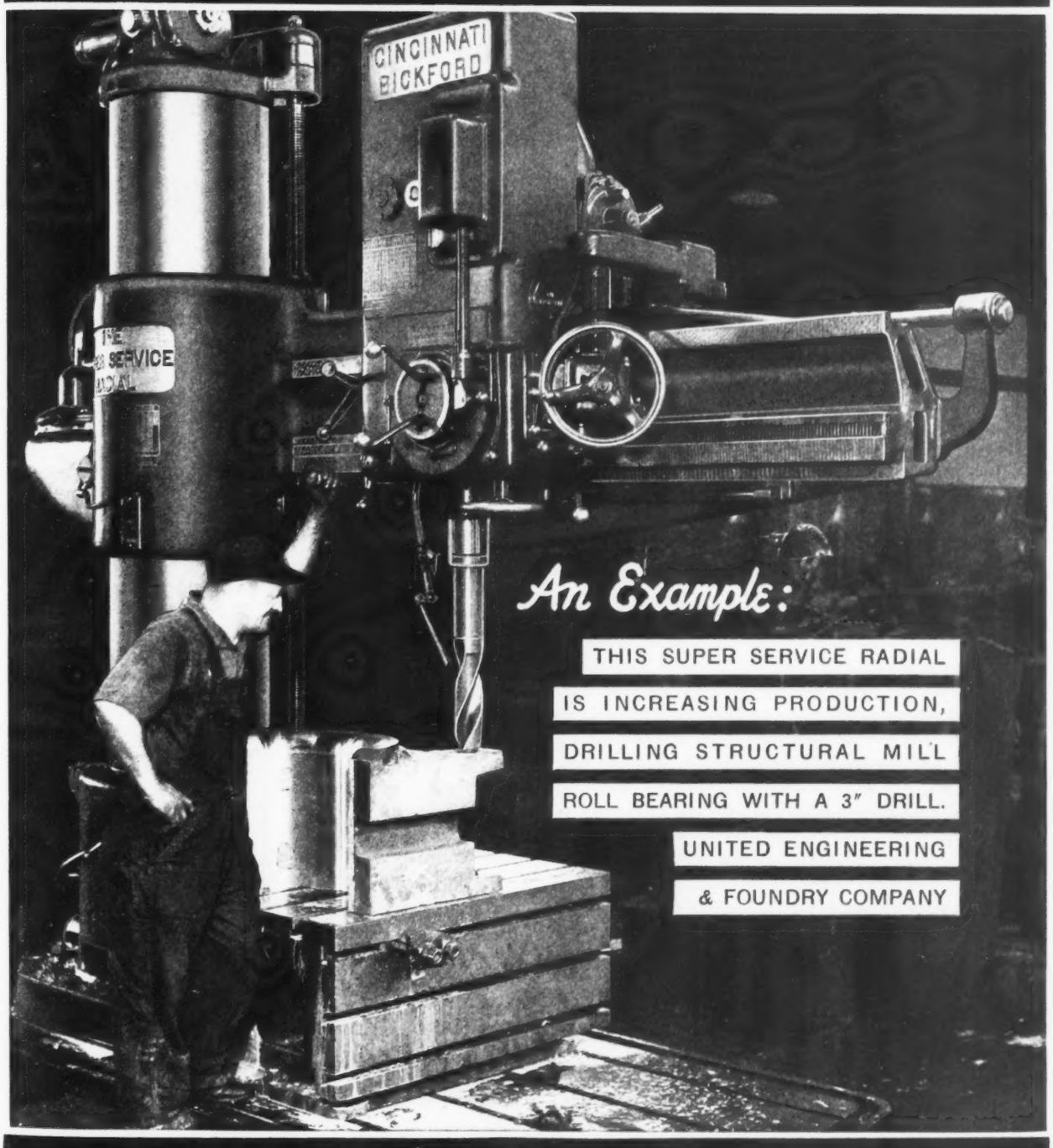
A motor control built on much the same principle as sectional filing cabinets, which permits all the needed types of control devices to be assembled in locker-like motor control centers, has been developed by Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee, Wis. The standardized construction permits control centers to be built up quickly to meet any requirements. Future changes due to expansion, change in shop layouts, etc., can be quickly and easily taken care of by adding or removing sections or by replacing the unit controllers.

These sections are made in thirty-two sizes, eight widths, four heights, and one depth, for mounting in any desired combination. Standard units can be furnished to accommodate controllers, disconnect switches and accessories, as required. Control units can be mounted in both the front and rear of the section. The sections can be installed in a straight line, an L-shaped arrangement, or a U-shape, in which case the unit forms its own control room. 88

To obtain additional information on equipment described on this page, see lower part of page 172.

Throughout Industry...

THIS SUPER C B SERVICE TRADEMARK MEANS "MORE HOLES PER DOLLAR"!

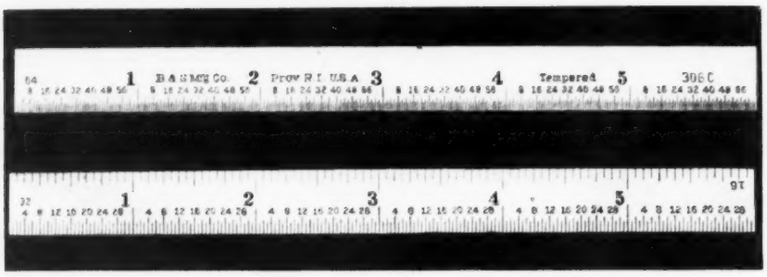


An Example:

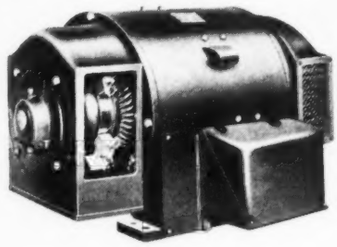
THIS SUPER SERVICE RADIAL
IS INCREASING PRODUCTION,
DRILLING STRUCTURAL MILL
ROLL BEARING WITH A 3" DRILL.
UNITED ENGINEERING
& FOUNDRY COMPANY

THE CINCINNATI BICKFORD TOOL CO.

OAKLEY · CINCINNATI · OHIO · U. S. A.



Brown & Sharpe Flexible Steel Rule with Graduations Arranged to Save Time



G-E Sleeve Bearing Self-ventilated 50-H.P. Motor

B&S Flexible Steel Rule

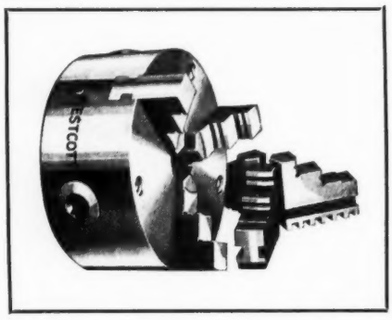
A new flexible steel rule has been added to the line of the Brown & Sharpe Mfg. Co., Providence, R. I. This rule—the No. 306C—is made only in a 6-inch length, and differs from other B & S rules in that one side is graduated in thirty-seconds of an inch on one edge and in sixteenths of an inch on the other. The opposite side is graduated in sixty-fourths of an inch on one edge only, enabling the user to employ any of the scales without turning the rule end for end. 89

H. O. Bates Nameplate Stamping Machine

H. O. Bates, 241 N. Broad St., Elizabeth, N. J., has developed a new nameplate stamping machine designated the No. 5, which is especially adapted for stamping numbers, letters, and other characters in airplane and motor parts, gages, dials, etc. This machine will stamp parts from 0.005 inch to 3 1/4 inches thick. Letters or numbers can be stamped on assembled parts, and also on nameplates after assembly, when the over-all dimensions of the assembled part do not exceed 9 by 8 by 3¼ inches thick. Pressure up to nearly 3 tons can be applied for stamping in stainless steel and other alloy metals. 90

Westcott "Oneida" Universal Lathe Chucks

A line of regular-duty chucks with semi-steel bodies and two sets of jaws which can be mounted on the



Westcott "Oneida" Lathe Chuck with Two Sets of Jaws

machine spindle by an adapter has been brought out by the Westcott Chuck Co., Inc., Oneida, N. Y. Each chuck is guaranteed to run true on center within a total indicator reading of 0.003 inch. These chucks are made in six sizes, ranging from 4 1/2 to 12 1/8 inches. 91

G-E Direct-Current Motors

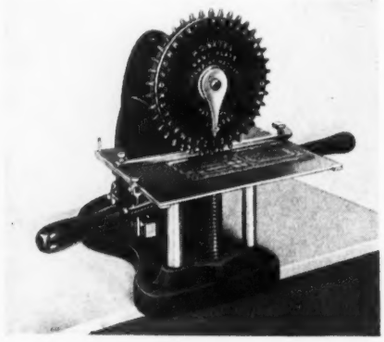
Compactness and improved protection are two outstanding features of a new line of direct-current motors built by the General Electric Co., Schenectady, N. Y. A new design of rolled-steel frame, and improvements in the end shield and bearing-bracket construction protect these motors from external damage. Formex wire coils and a specially developed Glyptal insulating varnish provide high resistance to impact and abrasion. The motors can be furnished with either sleeve or ball bearings.

Open motors are available in constant-speed ratings from 1/2 H.P. at 850 R.P.M. up to and including 60 H.P. at 1750 R.P.M. Adjustable-speed motors can be obtained in ratings from 1/2 H.P. at 850 to 3400 R.P.M. up to and including 15 H.P. at 500 to 1800 R.P.M. Motors in the larger ratings beginning at 50 H.P. at 850 R.P.M. have additional features such as a new system of self-ventilation and extra protection of all current-carrying and rotating parts. New V-type double brush-holders permit rotation in either direction. 92

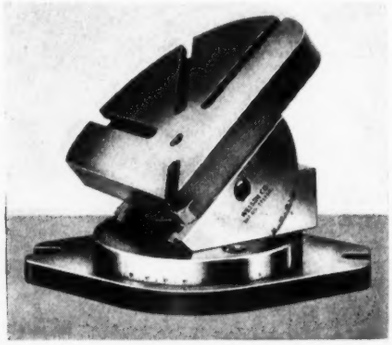
Wesson Universal Angle-Plate

The Wesson Co., 1050 Mt. Elliott Ave., Detroit, Mich., has just placed on the market a universal angle-plate designed for use on drill presses, grinders, and milling machines. This angle-plate is similar in construction to the Wesson universal vise described in June, 1939, MACHINERY, page 729. Instead of having vise jaws, however, the universal base is fitted with a slotted top plate that can be adjusted in three planes, graduations being provided for accurate setting in each plane.

Parts that are too large or too irregular in shape to be conveniently held in a vise can be clamped to the top plate by means of T-slots. Work involving a number of different oper-



Nameplate Stamping Machine Made by H. O. Bates

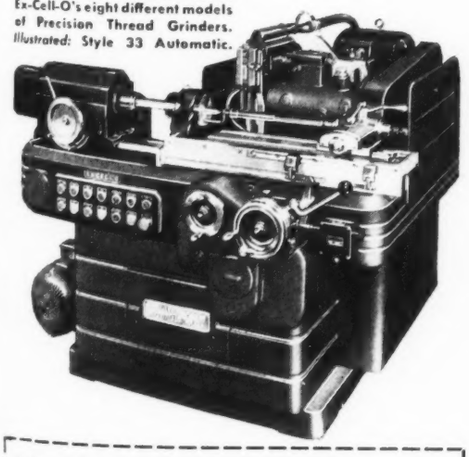


Wesson Universal Angle-plate for Drill Presses and Milling Machines

To obtain additional information on equipment described on this page, see lower part of page 172.

Vote the Straight EX-CELL-O PRECISION *Ticket!*

Select the exact type and style for your requirements from Ex-Cell-O's eight different models of Precision Thread Grinders. *Illustrated:* Style 33 Automatic.



Wherever extreme accuracy in threaded parts is essential, it is to your advantage to support the Ex-Cell-O platform based squarely on these sound planks: Closer Limits . . . No Distortion . . . Better Finish . . . Economy . . . Longer Life . . . Uniformity . . . Maximum Accuracy.

These superior qualities of Precision Thread Grinding, introduced to America by Ex-Cell-O, are consistently winning vote after vote from industry the country over . . . if you are not thoroughly acquainted with this increasingly popular process, get the facts . . . send today for a copy of the pamphlet, "Ex-Cell-O Sets the New Standard."

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Please send me the facts about Ex-Cell-O Precision Thread Grinding.
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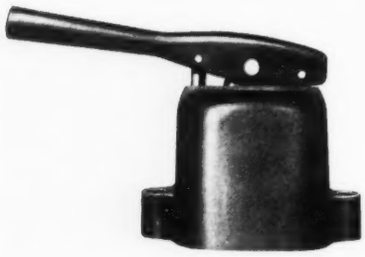
Company.....
Address.....

XLO *Precision* THREAD GRINDING, BORING AND LAPPING MACHINES, TOOL GRINDERS, GRINDING SPINDLES, HYDRAULIC POWER UNITS, DIESEL INJECTOR PUMPS, BROACHES, CUTTING TOOLS, DRILL JIG BUSHINGS, ETC.

ations at the same angle, when once clamped to the angle-plate and adjusted, need not be unclamped until finished, as the entire device and work can be moved from one machine to the other. 93



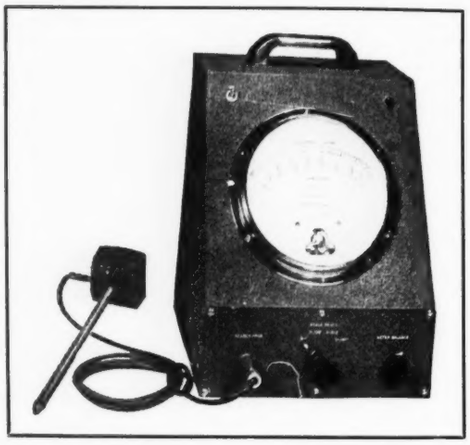
Valve for Controlling Two Double-acting Air Cylinders

Hunt Hand-Operated Four-Way Air Valve

C. B. Hunt & Son, 1855 E. Pershing St., Salem, Ohio, have just developed a double, four-way, hand-operated air valve that is adapted for the control of two individual double-acting cylinders. This valve has many applications on air-operated clamps, fixtures, knives, etc., and can be used wherever it is necessary to have one point of control for two cylinders that lead and follow each other in their respective actions. 94

Televiso Improved Vibrometer

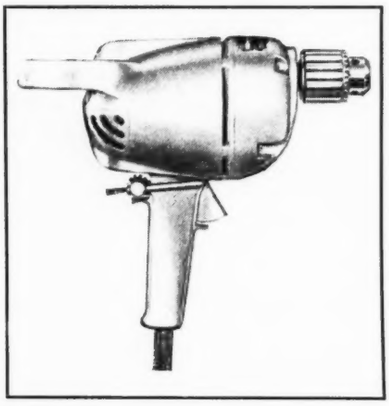
Televiso Products, Inc., 2400 N. Sheffield Blvd., Chicago, Ill., have placed on the market an improved vibrometer designed for fast and accurate electronic measurement of the amplitude of vibrations, regardless of the frequency with which the vibration-producing pressure is applied. The pick-up is connected to the vibrometer by 8 feet of heavy rubber cord, and has a hardened steel point tip for hand use. Fittings are also provided for permanently mounting the pick-up on the machine under test. The dial meter gives direct readings from 0.00001 to 1 inch in four ranges. The vibrometer is operated on 115-volt, 60-cycle current, is 15 inches high, 11 inches wide, 12 inches deep, and weighs 19 pounds. 95



Device for Measuring Amplitude of Vibrations

Skilsaw Portable Electric Drill

A new 1/2-inch drill has been announced to the trade by Skilsaw, Inc., 5039 Elston Ave., Chicago, Ill. This new Model 80 drill is of compact design and weighs only 8 pounds. It is completely equipped with anti-friction bearings. It is only 11 1/2 inches long over all, and 9 1/4 inches high.

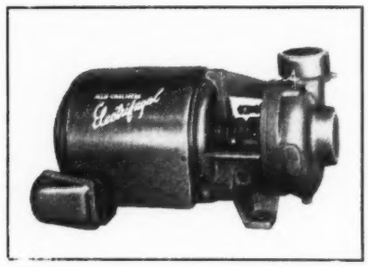


Skilsaw Portable Electric Drill

The universal motor has a no-load speed of 450 R.P.M. and a full-load speed of 300 R.P.M. Its drilling capacity in steel is 1/2 inch, and in hard wood, 1 1/4 inches. 96

Allis-Chalmers "Electrifugal" Pump

The Allis-Chalmers Mfg. Co., Milwaukee, Wis., has brought out a new pump designated the "Electrifugal," which is a complete unit comprising a centrifugal pump and motor assembled on one shaft in the same housing. The new pumping unit has a special motor with a one-piece cast-iron motor yoke and pump bracket. The feet are cast integral with the housing and bracket and extend under the entire unit.

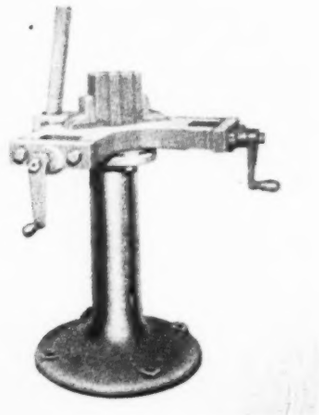


"Electrifugal" Pump Unit Brought out by Allis-Chalmers Mfg. Co.

The special motor design, with copper-bearing steel cover, meets the N.E.M.A. specifications for splash-proof motors. Totally enclosed, fan-cooled motors and explosion-proof motors are also available in the "Electrifugal" type. This pump is now available with splash-proof construction in sizes from 1 to 10 H.P., inclusive, with an operating speed of 3500 R.P.M. It is also available in 3/4- to 7 1/2-H.P. sizes with a speed of 1750 R.P.M. for heads up to 160 feet. 97

Naudain "Ever Ready" Bending Machines

The Naudain Mfg. Co., 1001 Rectory Lane, Baltimore, Md., has brought out a line of bending machines built in three sizes for bending cold or hot bars. The smallest machine will bend cold iron bars in a variety of shapes and sizes ranging from 4 inches by 1/8 inch to



Naudain Bending Machine

To obtain additional information on equipment described on this page, see lower part of page 172.

In vertical Milling Machines also, rigidity originates in the column — the backbone of the machine—and determines the productive capacity of the machine more than any one other factor.

Note how carefully the column of a Milwaukee Vertical Milling Machine has been engineered for the proper distribution of metal — an inside horizontal wall divides it into a double box section, the cross mounting of the motor permits a solid rear wall, which, together with the solid front face, assures an unusually rigid structure.

KEARNEY & TRECKER CORPORATION • Milwaukee, Wis. U. S. A.

KEARNEY & TRECKER
CORPORATION
Milwaukee
MILLING MACHINES

MILWAUKEE MILLING MACHINES

Fig. 1. Micro Die Duplicating Bender

3/4 by 3/4 inch, or hot bars 4 inches by 1 inch or 1 1/4 by 1 1/4 inches. The largest machine has a capacity for bending cold bars up to 8 inches by 1/8 inch or 1 1/8 by 1 1/8 inches, and hot bars up to 8 inches by 1 inch or 2 by 2 inches.

These machines have a two-way bending head and two working jaws, each operating independently of the other. The weights of the three machines are 225, 350, and 450 pounds, respectively. 98

Micro Hand-Operated Bench Tools for Duplicating Die Work

The O'Neil-Irwin Mfg. Co., 316 Eighth Ave. South, Minneapolis, Minn., has placed on the market a group of hand-operated bench tools designed for use in the production of small lots of metal stampings and formed parts such as are ordinarily made on punch presses equipped with expensive dies, when required in large quantities. The new bench tools consist of the Micro die duplicating bender, the Micro bench brake, and the Micro bench shear.

The die duplicating bender, shown in Fig. 1, is a basic bending machine that will duplicate many varieties of metal pieces, and is intended as a substitute for blanking or forming dies, eliminating, in many cases, the expense of making dies. It will also duplicate metal pieces with regard to shape and outline that are impracticable or impossible to obtain with blanking or forming dies.

The bender can be easily adapted for forming angle, channel, rod, round or square tube; round, square, half-round or flat wire and strip stock held on edge and vertically; and any other ductile materials. The heavy hexagonal base of the bender permits it to be held in a vise in six convenient positions. The nose automatically opens to receive material for semi-production work. The weight of the bender is 14 pounds.

The bench brake, shown in Fig. 2, is designed as a substitute for a precision die in duplicate forming of angle and channel materials from sheet and strip stock in sizes from 1/8 inch upward. It will also handle other types of work requiring folding to an angle of 110 degrees. In performing folding operations, the work is completely visible. Accurate stops are provided for duplicating all folding operations to a tolerance of 0.001 inch. The maximum folding width of this brake is 6 inches. The brake has a capacity for folding full-

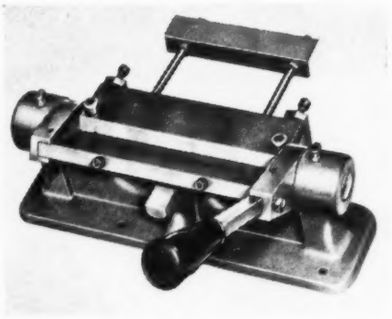


Fig. 2. Micro Bench Brake

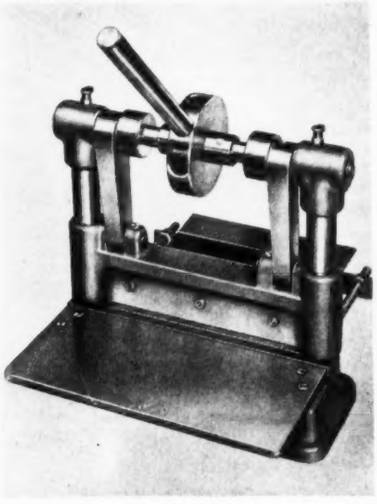


Fig. 3. Micro Bench Shear

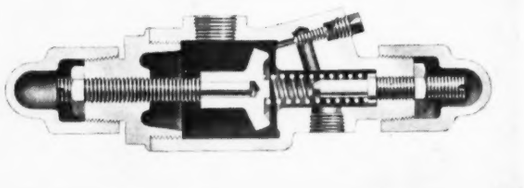
width 18-gage steel plates. This machine weighs 25 pounds.

The bench shear, shown in Fig. 3, is designed to meet the requirements for a precision shear for work between that handled on the heavy floor type, foot-operated shear and the small thumb- and finger-operated tinsmith shear. It can be set for accurately trimming metal stampings for die duplicating work and shearing material to size from stock sheets. Adjustable material guides are provided for accurate shearing to a tolerance of 0.001 inch. The maximum shearing width capacity is 6 1/4 inches. Steel plate of 24-gage can be sheared for the full width of the cutter, and 18-gage steel plate can be sheared in widths up to 1 inch. The weight of this shear is 25 pounds. 99

Murray Lorge Automatic Shut-Off Valve

An automatic shut-off valve, designed as a safety appliance for air or steam tools, has been placed on the market by the D. J. Murray Mfg. Co., Wausau, Wis. This valve, known as the Murray Lorge, can be used with compressed gas, water under pressure, high-pressure fire hose, acetylene torches, or in any line where a flexible hose is used for fluids or gases under pressure. In the event that the flexible hose breaks or becomes disconnected by accident or faulty connections, the valve closes automatically and prevents the flexible hose from whipping around in a dangerous manner.

The use of this valve permits changing tools without shutting off the supply of compressed air or steam at its source. After the workman has completed the connecting up of a different tool, the valve automatically reopens when the pressure in the flexible hose becomes equal to the pressure at the valve inlet. 100



Murray Lorge Automatic Shut-off Valve

* * *

Inconel sheets are being increasingly used for the construction of carburizing boxes, nitriding furnace linings, airplane exhaust manifolds, and many other applications involving high-temperature exposure, in place of cast metal.

To obtain additional information on equipment described on this page, see lower part of page 172.

Announcing... "SENIOR" PRESSES

BY COLONIAL

A line of low cost, general purpose hydraulic presses for assembling, broaching, etc. . . . 7 sizes . . . 1 to 10 tons capacity . . . 18 to 42 inch stroke . . . Open side table for working on long parts . . . Minimum floor space with motor mounted in column . . . Large amount of daylight for large fixtures . . . Direct driven high capacity hydraulic pump located within oil tank for maximum efficiency . . . Rugged construction throughout . . . Low priced through standardized design . . . Also available with special hydraulic circuit permitting use of 'shuttling' fixtures . . . *For details send for Bulletin VBS-40.*

"JUNIOR"

. . . Presses by Colonial available in ½ and 1 ton sizes for bench or pedestal operation. Bulletin VJ1-40.

COLONIAL BROACH CO. 147 Jos. Campau DETROIT

NEWS OF THE INDUSTRY

Canada

ROBERT CROOKS STANLEY, chairman of the board and president of the International Nickel Co. of Canada, Ltd., has been awarded the Charles F. Rand gold medal by the American Institute of Mining and Metallurgical Engineers for "distinguished achievement in mining administration." The medal will be presented at the annual meeting of the Institute in February, 1941.

California

CARBOLOY COMPANY, INC., Detroit, Mich., is opening a branch office at 5905 Pacific Blvd., Huntington Park, Los Angeles, Calif. A complete stock of Carboloy tools, standard blanks, masonry drills, and wheel-dressers will be carried. A grinding demonstration room will also be maintained at the new office. J. W. DOODY and RAY D. MACK will have charge of the office. Mr. Doody has represented the company on the Pacific Coast for the last ten years, and Mr. Mack previously served as field and service engineer in Wisconsin.

H. J. BARTON has joined the Tool Steel Division of the Allegheny Ludlum Steel Corporation, Pittsburgh, Pa., in the southern California territory. For fifteen years he was sales manager of the Earle M. Jorgensen Co.

Illinois

WELDON ENGINEERING CO., 1791 W. Howard St., Chicago, Ill., has been established to act as direct factory representative in the Chicago area for the following manufacturers: ELECTRO LIFT, INC., manufacturer of electric hoists; the NATIONAL TIME & SIGNAL CORPORATION, manufacturer of welding timers; ROSS OPERATING VALVE CO., manufacturer of control valves for air, oil, and water pressures; and the TOMKINS-JOHNSON CO., manufacturer of air and hydraulic cylinders, riveters and clinchors, air chucks, and coolant pumps.

WHITING CORPORATION, Harvey, Ill., has acquired the QUICKWORK CO., Chicago, Ill., manufacturer of shears, trimming and forming machines, hammers, and flangers. The entire Quickwork line will be manufactured at the Whiting Corporation's plant in Harvey. STEVENS H. HAMMOND, vice-president of the Whiting Corporation, will be in charge of all Quickwork operations, PAUL V. HYLAND, of the Whiting industrial division, will be sales manager, and B. W. PACKER, formerly with the Quickwork Co., will serve as chief engineer of the new organization.

J. T. SUTLIFF has been placed in charge of the Chicago office of the Roots-Connersville Blower Corporation, located at 122 S. Michigan Ave. E. A. COONS will assist Mr. Sutliff.

Michigan

GEOMETRIC TOOL CO., New Haven, Conn., announces that with the discontinuance of the Mill Supply Department of the National Supply Co., Toledo, Ohio, representative of the company for many years, the sale of Geometric threading tools and machines in northwestern Ohio has been taken over by the Detroit office of the Geometric Tool Co. located at Room 315B, Boulevard Bldg., Woodward at Grand Blvd., Detroit, Mich.

ROY A. MCELHINNEY, formerly superintendent of the Mid-West Abrasive Co., Detroit, Mich., has been made production manager for all the manufacturing units of the company's plants. Mr. McElhinney will make Detroit his headquarters. He has been connected with the company since 1937, and prior to that was associated with both the Chrysler Motor Car Corporation and the General Motors Corporation.

Roy A. McElhinney, Recently Appointed Production Manager of the Mid-West Abrasive Co.

TOMKINS-JOHNSON CO., Jackson, Mich., has appointed RALPH W. ATKINSON, Bartlett Bldg., 215 W. 7th St., Los Angeles, representative of the company in California. The WELDON ENGINEERING CO., 1791 Howard St., Chicago, Ill., has been appointed a representative in the Chicago territory.

E. S. CHAPMAN, vice-president and general manager, Plymouth Division, Chrysler Corporation, Detroit, Mich., has been nominated vice-president in charge of the Production Activity of the Society of Automotive Engineers for 1941.

MARTIN ELECTRIC CO., Detroit, Mich., manufacturer of resistance welding transformers, is completing an addition to its plant on E. Outer Drive which will double the manufacturing floor space and will add more than 100 per cent to the production capacity.

R. L. HIBBARD, formerly of the New York office of Cutler-Hammer, Inc., Milwaukee, Wis., has become a member of the merchandising sales staff of the Detroit office.

New England

NORTON CO., Worcester, Mass., announces several transfers in the sales department of the Abrasive Division. C. MILTON EKBERG has been appointed field engineer in the Chicago district, and WILLIAM A. RUSSELL field engineer in the Pittsburgh territory. ALDEN P. JOHNSON has been transferred to South Bend, Ind., as a salesman assisting J. B. ECKSTEDT. J. L. DEVOU, who has been engaged in field engineering work in the Chicago and Cleveland districts, has been appointed a salesman, with headquarters in Toledo, Ohio, assisting R. H. CANNON.

J. S. DIEFENBACH, of Derby, Conn., has joined the sales force of L. Heres De Wyk & Co., 133 S. Cliff St., Ansonia, Conn., engineers and manufacturers' agents. Mr. Diefenbach graduated in 1932 from the Rensselaer Polytechnic Institute as a mechanical engineer, and has been working up to the present time as production engineer with the Shelton Tack Co., of Shelton, Conn.

New Jersey

WRIGHT AERONAUTICAL CORPORATION, Paterson, N. J., is planning to build and equip the first magnesium foundry in the United States for the manufacture of castings for aircraft engines. This foundry will occupy a building 200 by 500 feet in size at Fairlawn, N. J., and will be the third foundry unit now operated by the corporation.

ALUMINUM CO. OF AMERICA, 1943 Gulf Bldg., Pittsburgh, Pa., has awarded a

Last word ON PRECISION GAGES AND GAGING

"SHEFFIELD GAGES" just off the press is a comprehensive presentation of precision gages — design, construction and application together with standards and constants useful in practical inspection work.

Manufacturers engaged in the manufacture of engines, machine tools, automotive or military equipment, or any enterprise where inter-changeability of parts is essential, will find this book very useful.

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THE SHEFFIELD GAGE CORPORATION

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DAYTON, OHIO, U. S. A.

contract to the Turner Construction Co. of New York, for the construction of a large factory addition to its Edgewater, N. J., plant. The new factory, which will be eight stories in height and will measure 141 by 81 feet, will be used for the manufacture of aluminum structural shapes and other parts for airplanes.

MANHATTAN RUBBER MFG. DIVISION OF RAYBESTOS-MANHATTAN, INC., Passaic, N. J., announces that the company now carries the Condor Whipcord endless belts in stock for immediate shipment in a number of sizes and in two styles capable of handling drives from 1/4 to 25 H.P.

New York

ELECTRO METALLURGICAL SALES CORPORATION, UNIT OF UNION CARBIDE AND CARBON CORPORATION, 30 E. 42nd St., New York City, announces the appointment of the following division managers: S. C. DU TOT, in charge of sales activities in the Birmingham, Pittsburgh, Cleveland, and Detroit areas, with headquarters at Pittsburgh; W. E. REMMERS, who will have charge of sales in the Middle West, including all territory east of the Rocky Mountains, and will make his headquarters at Chicago; and R. E. BROWN, in charge of sales on the Pacific Coast, including all territory west of the Rocky Mountains. Mr. Brown will continue to maintain his office at San Francisco.

H. J. FRENCH and T. N. ARMSTRONG, metallurgists of the Development and Research Division of the International Nickel Co., Inc., 67 Wall St., New York City, have been awarded the 1940 Lincoln Gold Medal for their technical paper entitled "Weld Hardening of Carbon and Alloy Steels," which was presented before the American Welding Society at the National Metal Congress in Chicago last year. Presentation of the medals was made at the annual meeting of the American Welding Society held on October 21 at the Hotel Cleveland in Cleveland, Ohio.

AMERICAN MAGNESIUM CORPORATION, with headquarters in New York City, is tripling its fabricated magnesium output to meet present demands. The company's foundry at Cleveland, Ohio, is now producing more than three times the amount of magnesium products that it did in July a year ago. The magnesium powder plant, also at Cleveland, will produce ten times the normal requirements in the near future. This powder is being produced for the United States Army and Navy for use in tracer bullets and flares.

GENERAL ELECTRIC CO., Schenectady, N. Y., is spending $11,500,000 in expanding its present facilities for manufacturing steam turbines and propulsion equipment for the U. S. Navy. The expansion program involves equipping existing buildings at the company's Erie, Pa., works with heavy machinery for the manufacture of large steam turbines, and enlarging two of the Lynn, Mass., shops where the reduction gears are built.

BAKELITE CORPORATION, UNIT OF UNION CARBIDE AND CARBON CORPORATION, New York City, sponsored two technical meetings on plastics and synthetic resinous products at the Chicago Museum of Science and Industry, October 21 and 23. The theme of the first meeting was "New Developments in Molding Plastics," and of the second, "Current Trends in Protective Coatings."

GILBERT L. WOLFE has been appointed representative of the American Nickeloid Co., Peru, Ill., covering the sales of prefinished metals in central New York State, with headquarters at Schenectady, N. Y. Mr. Wolfe was previously employed by the Revere Copper & Brass Co. at Rome, N. Y., and at New Bedford, Mass.

ARNOLD L. NACKE has been appointed sales agent in New York City for the Modern Tool Works, Rochester, N. Y., and will handle the sales of Modern Magic chucks, die-heads, and other tools in the metropolitan district. The New York office is located at 92 Bleecker St.

H. A. SMITH MACHINERY CO., Erie Blvd., East, and S. Townsend St., Syracuse, N. Y., has been appointed a distributor for the SULLIVAN MACHINERY CO., manufacturer of air and gas compressors for industrial uses.

Ohio

C. B. KETCHAM has been promoted to the position of manager of the Cincinnati, Ohio, office of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., succeeding the late F. R. Colville. C. G. JEWETT has been made manager of the Columbus, Ohio, office. Mr. Ketcham served for ten years as manager of the Westinghouse office in Columbus, and has been connected with the company for nearly thirty years. Mr. Jewett's promotion follows fifteen years of association with the Cincinnati office.

TIMKEN ROLLER BEARING CO., Canton, Ohio, is planning to install a new 60-ton electric furnace to meet the increased demand for aircraft steel. The expenditure involved is $500,000. This is the second 60-ton electric furnace installed by the company in recent months. When placed in operation, it will increase the company's electric steel production from 21,000 to 27,000 net tons a month.

LIBERTY PLANER & MFG. CO., 1000 Weller Ave., Hamilton, Ohio, has been formed to succeed the LIBERTY MACHINE TOOL CO. The new company will manufacture the complete line of Liberty double-housing, open-side and convertible planers. The officers of the company are HARRY A. DINGELDEIN, president; H. R. RYAN, vice-president; and L. G. L. THOMAS, secretary-treasurer.

HENRY J. MCKENZIE, executive vice-president and general manager of the Sterling Pump Corporation, Hamilton, Ohio, manufacturer of deep-well turbine and centrifugal pumping units, has been appointed president of that corporation to succeed MAURICE ROTHSCHILD, who will continue as a director.

DR. CLAUDE L. CLARK, formerly of the Department of Engineering Research of the University of Michigan, has joined the metallurgical staff of the Steel and Tube Division of the Timken Roller Bearing Co., Canton, Ohio, as metallurgical development engineer.

RICHARD P. DODDS, advertising and sales promotion manager of the TRUSCON STEEL CO., Youngstown, Ohio, was elected president of the National Industrial Advertisers' Association at its recent annual conference in Detroit.

STERLING PUMP CORPORATION, Hamilton, Ohio, has acquired the Turbine Pump Division of the ROOTS-CONNERSVILLE BLOWER CORPORATION, Connersville, Ind.

A. T. COLWELL, vice-president of Thompson Products, Inc., Cleveland, Ohio, has been nominated for president of the Society of Automotive Engineers for 1941.

Pennsylvania and Maryland

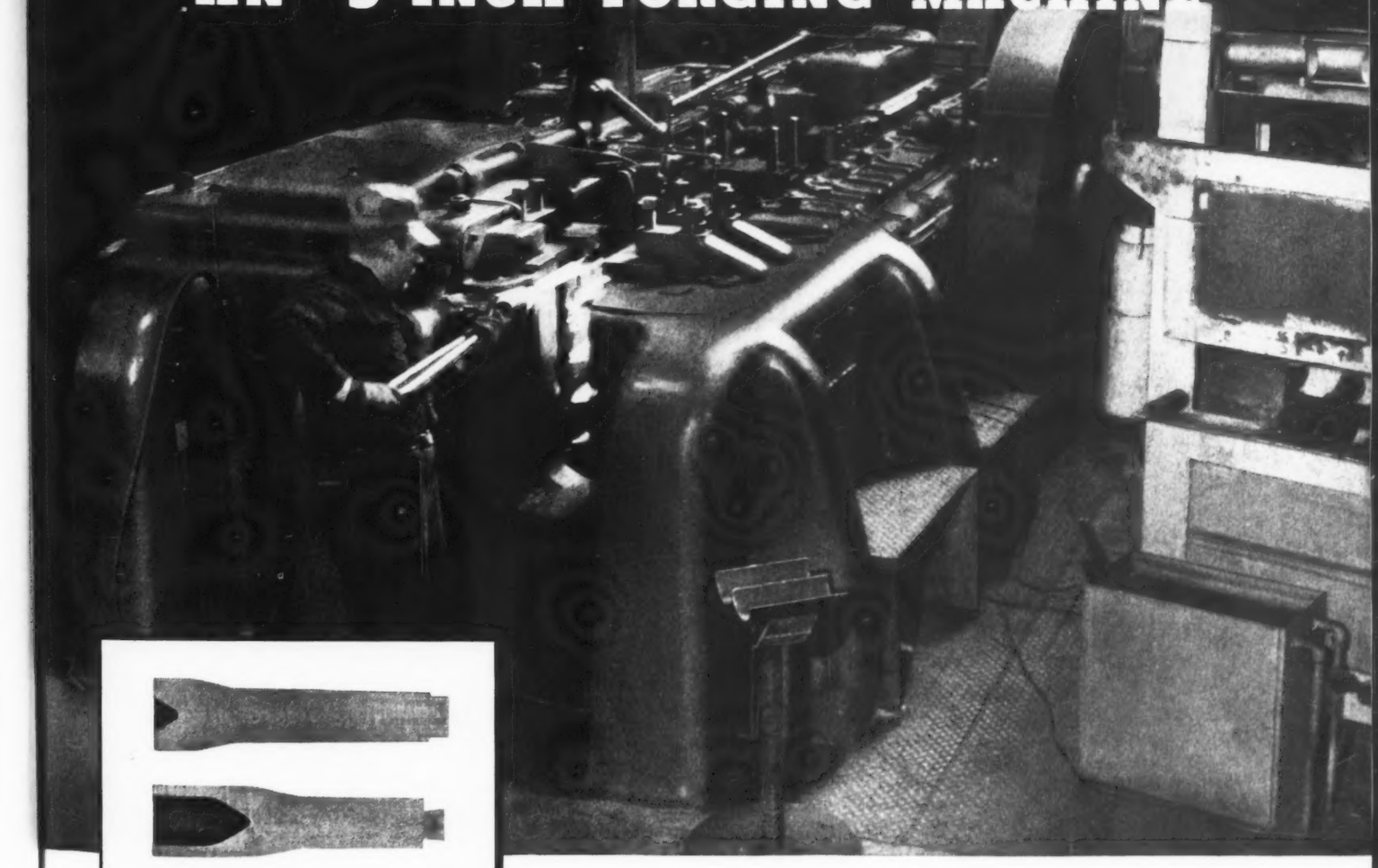
JESSOP STEEL CO., 605 Green St., Washington, Pa., announces that its production of special alloy steels for the aircraft industry has been extended to include heat-treated and cold-drawn annealed bar products. The manufacture of Jessop aircraft steels was formerly confined to sheets and plates. Both types of aircraft steels are now available in the principal analyses required by the industry.

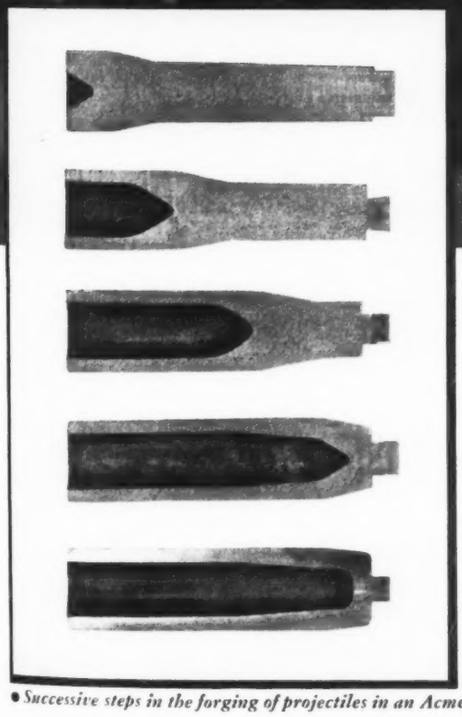
KITSON CO., 2409 Westmoreland St., Philadelphia, Pa., has acquired the exclusive rights for the manufacture and distribution of Oman self-lubricating metal, a solidified emulsion of lead in copper, which is self-lubricating and especially adapted for inaccessible bearings where other lubrication is difficult or impracticable.

FIRTH-STERLING STEEL CO., McKeesport, Pa., announces a price reduction on the company's sintered carbide tools and dies. It is stated that the new carbide prices make it possible, in many instances, to manufacture or purchase carbide-tipped tools at costs approximating those of solid high-speed steel tools.

Latest Practice –

IN FORGING SHELLS ON AN ACME "XN" 5-INCH FORGING MACHINE





• *Successive steps in the forging of projectiles in an Acme XN forging machine.*

• Here is one of the 5-inch ACME XN forging machines at work forging projectiles for our own preparedness program. Forging practice has advanced during recent years to the point that so great a degree of accuracy can be maintained in steady production that it is no longer necessary to machine the internal surfaces of the shell. Specified tolerances on shell bores, minus nothing, plus .020", are easily maintained.

This ACME XN forging machine will produce 75-mm. shells at the rate of 75 an hour. It will forge 105-mm. shells with change of dies. This powerful machine's frame, a one-piece steel casting, accounts for over 100,000 lbs. of the total weight of 190.000 lbs. Five cavity dies are used to forge the shells. Pilot holes in plate at front of fixed die serve to insure a true center for punches and also act as a stripper.

This machine is now equipped with a manipulator, (*patents applied for*) developed by Acme engineers to sustain entire weight of the forging, thereby eliminating fatigue of the operator. It transfers and locates stock mechanically in each groove of the dies progressively, thereby increasing production 10% to 15%.

All ACME XN forging machines have the eccentric type main shaft, fully suspended header slide and suspended die slide, with double toggles. A catalog fully describing them will be sent on request.

ACME MACHINERY DIVISION

of THE HILL ACME COMPANY

Established 1862

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FORGING • THREADING • TAPPING • BOLT • NUT • RIVET MACHINES

IRVING H. JONES has been appointed manager of railroad sales of the Allegheny Ludlum Steel Corporation, Pittsburgh, Pa. C. A. PECK has joined the tool steel department of the Chicago office of the concern.

T. T. WATSON, who has been development and service metallurgist of the Lukens Steel Co., Coatesville, Pa., since 1934, has been appointed research metallurgist in charge of all plant research.

ERNEST L. MAWHINNEY, personnel director of the Jessop Steel Co., Washington, Pa., has recently been appointed safety director of the company.

WESTINGHOUSE ELECTRIC & MFG. CO. has completed the first of three new buildings at the company's Radio Division in Baltimore, Md., which will double the production facilities for Army and Navy radio equipment.

Wisconsin

HOBART S. JOHNSON, formerly president of the Gisholt Machine Co., Madison, Wis., has been made chairman of the board, and will be succeeded as president by his son, GEORGE H. JOHNSON. This is the third consecutive generation of the Johnson family to hold the position of president, the company having been founded by John A. Johnson, grandfather of George H. Johnson, in 1889. H. S. JOHNSON, JR., has been elected a vice-president. A. B. MOREY will continue as treasurer, and G. E. GERNON as secretary.

PEERLESS MACHINE CO., Racine, Wis., has expanded its manufacturing space by the acquisition of an adjoining building to meet the increased demand for Peerless metal-cutting saws. In the new building there will be a large demonstration room, where all sizes and types of Peerless saws will be on exhibition under power.

* * *

Industry's Challenge to Research

The Research Advisory Service of the Liberty Bank of Buffalo, N. Y., of which Bert H. White, vice-president, is director, has issued a booklet entitled "What New Product, Process or Material Might Industrial Research Develop that Would be Valuable to Your Industry?" This question was put to a large number of America's outstanding industrial leaders. The booklet contains a condensed report based on over a thousand answers. It lists what industry would like to have in the way of products, instruments, methods, and equipment not now available on the market. The booklet might be called a "list of suggestions for needed inventions and research."

OBITUARIES

H. H. Timken, Sr.

H. H. Timken, Sr., chairman of the board of the Timken Roller Bearing Co., Canton, Ohio, died of pneumonia on October 14 at his home in Canton. Mr. Timken had been active up to the time of his death in the business that he founded with his father and brother in 1898. His two sons, H. H. Timken, Jr., and W. Robert Timken, have also taken an active part in the management of the company in recent years.

Mr. Timken attended the St. Louis, Mo., public schools, and spent many of his vacation periods in his father's carriage works, where he observed firsthand the processes of manufacturing. Upon graduation from St. Louis High School, where he was an honor student, he enrolled in Washington University in St. Louis. He entered the University of California and was graduated from there with a law degree. Admitted to the bar in California, he immediately began the practice of law in San Diego.

H. H. Timken, Sr.

When his father reentered the carriage and wagon-making field at St. Louis, he gave up law and joined him in the business. Beginning as a day laborer, he worked from the ground up. He became a foreman, then a department head, and finally, factory manager. It was shortly after his advancement to his position of factory manager that his father perfected the principle of the Timken tapered roller bearing, the chief applications of which were on Timken wagons and carriages. Within a comparatively short time, bearings and axles formed the bulk of the Timken production.

When the father retired and left his two sons, Henry H. and William R. Timken, to manage the carriage business, the young manufacturers realized that it would be only a matter of time until motor-powered carriages would replace the slower, horse-drawn vehicles. Realizing that they were located too far from their source of supply and the potential automobile market, they moved the company to Canton, Ohio, and started production with a force of less than fifteen men in a two-story factory building shortly after January 1, 1902.

Mr. Timken became active head of the plant. At this time he had no salesmen so he took to the road himself, leaving the operation of the plant to his brother and assistants. Many cars already were in production and others were being designed in scores of little machine shops in and around Detroit. Mr. Timken visited them all and between visits to the factories already producing automobiles, he called on designers in machine shops, selling them the idea of using the Timken tapered bearing.

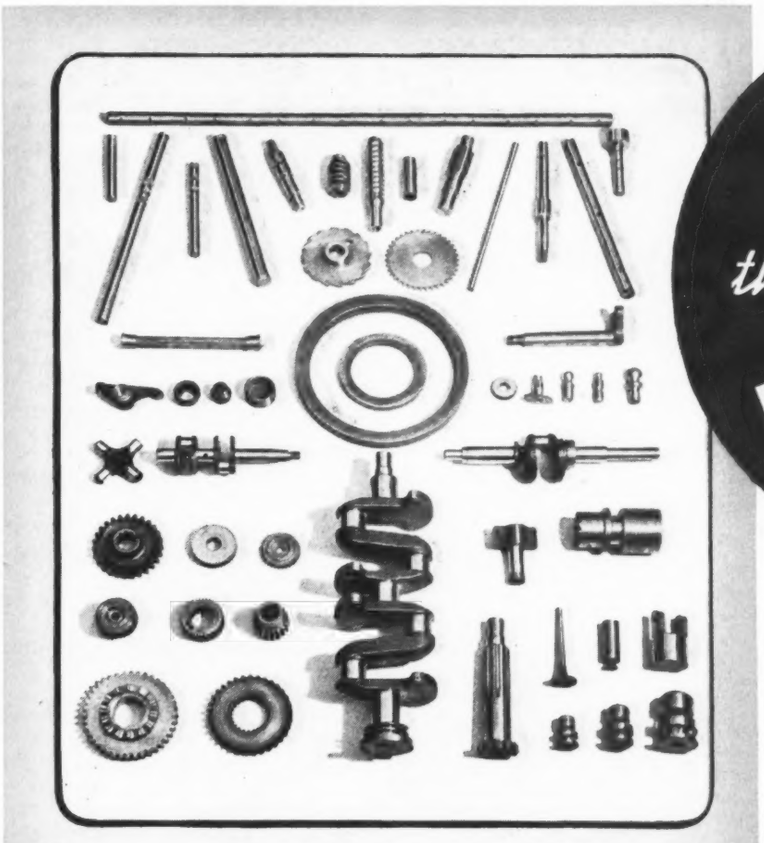
With the company firmly launched in the automotive trade, Mr. Timken directed his attention to another important phase of the business—the development of new steel alloys. He began making steel in an electric furnace, and after months of experimenting and many discouraging set-backs, finally produced an alloy that met his requirements. The new metal proved so successful that soon other companies were ordering the new alloy and another product was added to the steadily growing Timken output. As the Timken factory expanded, Mr. Timken took a less active part in the factory management and devoted more of his time to supervision of the entire plant. He kept a close check on every department, production, research, engineering, sales, and office.

Mr. Timken was a philanthropist and benefactor to many and varied charitable institutions and welfare agencies. In his later years, he spent the winter and spring months in Palm Springs, Calif., and summers at his lodge on Georgian Bay. He is survived by his wife, three sons—Henry H., Jr., W. Robert, and John—two grandchildren, and a sister.

Robert Hadfield

Sir Robert Abbott Hadfield, world-famous metallurgist and chairman of Hadfield's, Ltd., Sheffield, England, died in London, September 30, at the age of eighty-one years. Probably there is no man in the iron and steel field whose name has been connected with so many outstanding developments and who has received so many honors in recognition of his achievements.

Sir Robert was born in Sheffield, in 1859, and was educated at the Sheffield Collegiate School. At an early age, he became interested in the metallurgy of iron and steel. Among the many developments for which he was responsible is manganese steel, which was first de-



SMALL PARTS *that are going to* LIVE LONGER!

● Here are 50 small and medium-sized parts, locally surface hardened by the TOCCO MG 10 Junior—a *brand new* TOCCO machine for the small-parts manufacturer. These parts—like all those hardened by TOCCO—will last longer and serve better than any hardened by ordinary heat-treating methods. Accurately hardened at the *wearing surfaces only*, they come from the inductor block free from scale, decarburization and costly distortion. In fact, the new MG 10 Junior offers induction hardening at its best and in its most flexible and economical form.

Each of the five MG 10 models, furnished with one to three hardening stations, is a self-contained unit having a special built-in high frequency motor generator set, pre-set full automatic controls, easily changed fixtures plus other proved TOCCO operating features. As the MG10 occupies but 5'x6'8" of floor space, its installation in a production line is easy and makes possible great savings in handling between machine line and heat-treat department.

Only recently introduced, the new TOCCO MG 10 Junior is already "going to town". With greater range and power it modernizes heat-treating practice and cuts heat-treating costs. Write today for full illustrated bulletin. Learn how TOCCO does it.

A 40 MG 10 TOCCO Junior—one station. Shown is a special fixture for hardening Valve Rocker Shafts. Each shaft is hardened at six areas. Capacity—100 shafts hourly.

The First Seven

TOCCO's first seven orders for the new MG 10 Junior were received while the unit was still in the Development and Research Laboratory. Even in that early stage, operation was convincing.

Five MG Models

(10 to 80 KW output)

10 MG 10 — 40 MG 10
20 MG 10 — 60 MG 10
80 MG 10

Interpretation: Left numeral—KW output. MG symbol—motor generator. Right numeral—indicates 9600 cycles.

THE OHIO CRANKSHAFT COMPANY
CLEVELAND, OHIO

scribed by him in 1883, when the process for making it was patented. He also developed a magnetic steel of high permeability especially suitable for use in electrical machinery, and his work in connection with silicon steels was noteworthy. The development of a new armor-piercing shell for 16-inch guns and its production by his company were first announced by him in 1925. In 1932, he disclosed the development of another type of armor-piercing projectile of remarkable properties.

Sir Robert was a director in a number of important industrial concerns, as well as being chairman of Hadfield's, Ltd., which was originally founded by his father in 1872 as the Hadfield's Steel Foundry Co. During the last World War, this company employed 15,000 men.

He received many honors from societies and associations in the steel and metallurgical fields all over the world. In 1904, he was presented with the Bessemer gold medal by the Iron and Steel Institute of Great Britain. In 1908, he was knighted, and in 1917 he was made a baronet. In fact, the honors that he received take up more than a column in the British "Who is Who." Among these are the Elliott-Cresson gold medal which was awarded him by the Franklin Institute.

His published material includes 222 papers on scientific and engineering subjects read before various societies. His book "Metallurgy and Its Influence on Modern Progress" is considered a standard work of reference in its field.

PAUL A. TOPEL, well-known small tool salesman who has been connected with the Chicago office of the Brown & Sharpe Mfg. Co., Providence, R. I., for nearly twenty-five years, died suddenly on October 4 in his fifty-ninth year.

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Toolmakers Needed by the Government

To meet the great demand for toolmakers for the National Defense Program, the United States Civil Service Commission urges qualified men to make application for this work. Immediate appointments are to be made at ordnance and naval establishments in Philadelphia, Pa.; Boston, Springfield, and Watertown, Mass.; Watervliet, N. Y.; and Washington, D. C. Approximately six hundred toolmakers will be added at the Frankford Arsenal alone. All applicants must have completed a four-year toolmaker's apprenticeship or must have had four years of practical experience in the trade. For further information, apply to the Secretary of the Board of U. S. Civil Service Examiners at any first- or second-class post office, or to the U. S. Civil Service Commission, Washington, D. C.

COMING EVENTS

NOVEMBER 8-9—NATIONAL TIME AND MOTION STUDY CLINIC to be held at the Chicago Towers Club, Chicago, Ill., under the auspices of the Industrial Management Society. For further information, address W. F. Entorf, Industrial Management Society, 205 W. Wacker Drive, Chicago, Ill.

NOVEMBER 12-13—Conference of the AMERICAN MANAGEMENT ASSOCIATION at the Hotel Cleveland, Cleveland, Ohio, on Production Problems. Alvin E. Dodd, president, American Management Association, 330 W. 42nd St., New York City.

DECEMBER 2-5—Annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS in New York City. C. E. Davies, secretary, 29 W. 39th St., New York City.

DECEMBER 2-7—Fourteenth NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING to be held at the Grand Central Palace, New York City. For further information, address International Exposition Co., Grand Central Palace, New York City.

DECEMBER 11-15—NATIONAL CHEMICAL EXPOSITION at the Stevens Hotel, Chicago, Ill. For further information, address National Chemical Exposition, 110 N. Franklin St., Chicago, Ill.

JANUARY 6-10, 1941—Annual meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at Book-Cadillac Hotel, Detroit, Mich. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York City.

JUNE 16-20, 1941—Semi-annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Kansas City, Mo. C. E. Davies, secretary, 29 W. 39th St., New York City.

Light that is Bent Around Corners

The properties of the crystal-clear plastic known as "Lucite" have previously been referred to in MACHINERY. This material is capable of transmitting cold light through a curved path; in other words, if one end of a bent bar or rod of Lucite is connected with a light source, the other end will emit cold light.

By making use of this material, the Emeloid Co., Inc., Arlington, N. J., has produced a simple device known as "Mekanix-lite," which is particularly handy for repair men and for use in machine shops for lighting interior surfaces that would otherwise be inaccessible. The device simply consists of a battery-operated flashlight controlled by a switch at the side, into which is screwed the bent bar of Lucite.

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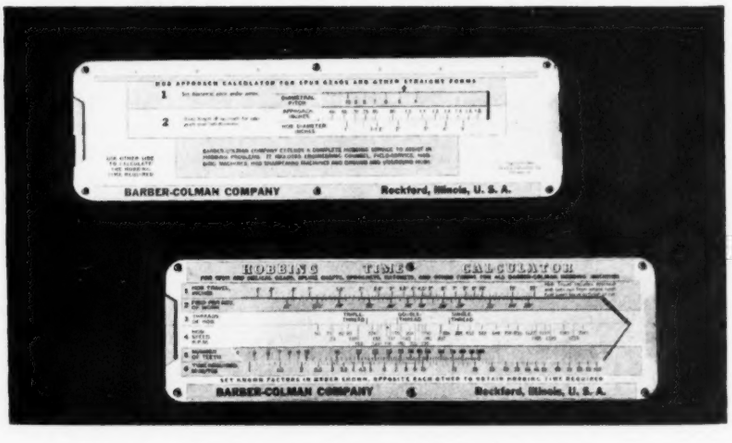
Barber-Colman Hobbing Time Calculator

A slide-rule designed to simplify the calculation of hobbing time has been developed by the Barber-Colman Co., Rockford, Ill. One side of the rule is designed for the calculation of the "hob approach" for spur gears, spline shafts, and other straight hobbed forms. This "hob approach," when added to the length of the spline or width of the gear face, gives the total length of hob travel which is used in calculating the hobbing time. The hobbing time is obtained by setting the two slides on the reverse side of the slide-rule.

The rule contains all the standard hob speeds that are found on the Barber-Colman hobbing machines. By a slight amount of interpolation, this calculator can be used for other makes of hobbing machines. The calculator is available free of charge to all time estimators, production managers, superintendents, and foremen who have to do with hobbing problems.



Slide-rule Designed to Simplify the Calculation of Hobbing Time